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THE

# PRINCIPLES OF SURGERY,

Medical AS THEY RELATE TO Faculty

## WOUNDS, ULCERS, AND FISTULAS;

ANEURISM AND WOUNDED ARTERIES; FRACTURES OF THE LIMBS; AND THE DUTIES OF THE MILITARY AND HOSPITAL SURGEON.

McGill ALSO, University

## A SYSTEM OF SURGICAL OPERATIONS,

CONTAINING

**The Principles of Surgery,**

AS THEY RELATE TO SURGICAL DISEASES AND OPERATIONS.

AND

## A SERIES OF CASES,

CALCULATED TO ILLUSTRATE CHIEFLY THE DOCTRINE OF TUMOURS, AND OTHER IRREGULAR PARTS OF SURGERY;

And to instruct the Young Surgeon how to form his Prognostics, and to plan his Operations.

BY JOHN BELL, SURGEON.

IN THREE VOLUMES.

ILLUSTRATED BY ONE HUNDRED AND SIXTY PLATES.

VOL. I.

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1815.

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TO THE SURGEONS OF LONDON,

AND IN A PARTICULAR MANNER,

TO DR. MATHEW BAILLY, MR. LYNN, OF WESTMINSTER HOSPITAL,

MR. WILLIAM BLIZZARD, MR. ASTLEY COOPER,

AND

MR. ABERNETHY OF ST. BARTHOLOMEW'S,

THIS BOOK IS PRESENTED BY THE AUTHOR,

WITH EVERY SENTIMENT WHICH THE REMEMBRANCE OF

THEIR HOSPITABLE, KIND, AND LIBERAL CONDUCT,

SHOULD INSPIRE.

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# ADVERTISEMENT.

THE Author will make no apologies for a book which is too long not to have many faults; he preſumes to offer it to the Public as a proof of his diligence and love of his profeſſion, to his Pupils as an act of reſpect and duty, and he has dedicated it to men of liberal minds, zealous for the improvement of Science, who have been pleaſed to think very favourably of his former efforts; who know how to excuſe whatever they find in this Volume unworthy of them or of the Author; who know alſo how to receive this token of eſteem and friendſhip, not according to its real value, but the ſpirit in which it is preſented.

The Author hopes his book will be found to be written in a liberal manner, repreſenting the Hiſtory, the Theories, the Rules, and the Actual Practice of Surgery, in one connected view. Amidſt unavoidable ſpeculations and occaſional illuſtrations of various kinds, he has never loſt ſight of practice; he has endeavoured to improve the minutiæ of ſurgery, to give importance to the moſt ordinary duties of the ſurgeon, and to teach young men to practiſe their profeſſion with humanity, zeal, and charity. He has in this Volume laid down the Principles of Surgery, as they relate to the three great ſubjects of Wounds, Aneuriſms, and Fractures; the next Volume will contain a circle of Surgical Operations; and although, in appearing again before the Public, he muſt feel ſome ſelfiſh anxieties, yet there is one thought very natural on this occaſion, which it cannot be unbecoming to expreſs: The Author wiſhes ſincerely that the errors of his book may belong only to the form and compoſition, not to the matter of it: Such errors, however dangerous to the Author's reputation, will not miſlead the young ſurgeon, for whoſe uſe this ſyſtem is deſigned.

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A

# SHORT PRELIMINARY DISCOURSE

ON THE

## EDUCATION AND DUTIES OF A SURGEON.

I AM now entering, Gentlemen, upon a courſe of Surgery, which will be of little ſervice to you, unleſs I lead you onwards by gradual ſteps from theory to practice; from the common principles of Surgery, and the moſt ordinary duties of the Surgeon, to thoſe important operations which it is ſometimes our duty to perform. In every profeſſion, the daily and common duties are the moſt uſeful; and in ours, the man who is capable of the great operations riſes into public eſteem, only becauſe it is preſumed, that he who is the moſt capable in the higher departments of his profeſſion, will beſt perform all its ordinary duties.

Yet ſuch is the natural horror at blood, and the heſitations and difficulties of the Surgeon himſelf when any thing ſo daring as a dangerous operation is to be done; and ſuch are the unceaſing and anxious inquiries of friends, that operations, though the leaſt part of our profeſſion, ſtrike a deeper intereſt into the public mind than the daily cures we perform. Operations uſurp an importance in Surgical Education which they ſhould not naturally have. Operations

have come at laſt to repreſent as it were the whole ſcience; and a Surgeon, far from being valued according to his ſenſe, abilities, and general knowledge, is eſteemed excellent only in proportion as he operates with ſkill.

On a future occaſion I ſhall have much to ſay to you on this very ſubject; at preſent, it is more natural, I believe, to offer you ſome rules, not for the practice of your profeſſion, but for the ſtudy of it; for if you ſtudy with real diligence, according to a ſenſible plan, thoſe good diſpoſitions will naturally grow up which every friend, which every teacher would wiſh you to cheriſh; you will feel a generous diſregard of every thing but opportunities of doing good, and promoting to the utmoſt of your power, the intereſts of humanity, of your profeſſion, and of general ſcience. From the cauſe of ſcience never allow yourſelves to be ſeparated by any ſelfiſh or partial views: From the day in which you devote yourſelves to a profeſſion which brings with it indiſcribable cares and difficulties, never ceaſe to think how you are to ſupport its intereſts, and to contribute each of you in his own private ſtation to make the profeſſion honourable, as well as uſeful. Such is the connexion of every individual with the art or ſcience to which he belongs, that were his profeſſion generally deſpiſed, his moſt honourable exertions would be of no avail. It is ſurely then no affectation to ſay, that I take the moſt ſincere intereſt in your ſtudies, your ſucceſſes, and your honourable conduct in the world.

I have been accuſtomed to regard the public ſervice of the State as a great ſchool of practical ſcience, as offering opportunities which more than compenſate the toils, the hardſhips, and the dangers of that way of life. It is a ſchool where a young man, after a reſpectable education, is ſure, while he improves in his profeſſion, to acquire liberal principles, polite manners, and a knowledge of the world. The ſituation of a Military Surgeon is more important than that of any other; while yet a young man, he has the ſafety of thouſands committed to him in the moſt perilous ſituations, in unhealthy climates, and in the midſt of danger. He is to act alone and unaſſiſted, in caſes where deciſion, and perfect knowledge are required; in wounds of the moſt deſperate nature, more various than can be imagined, and to which all parts of the body are equally expoſed; his duties, difficult at all times, are often to be performed amidſt the hurry, confuſion, cries, and horrors of battle. Even in the ſeaſons of the greateſt difficulty, cold and heat, hunger and fatigue, vexation of mind, and all the diſtreſſes of foreign ſervice, aggravate diſeaſe; and, while

they render his exertions of ſo much importance, teach him imperiouſly, the neceſſity of an accurate and ready knowledge of his profeſſion. It is to him that his fellow ſoldiers look up at the moments of diſtreſs: his charities and his friendſhips are prized beyond all price! What part of education is there, needful or even ornamental, for the Surgeon living at his eaſe in ſome rich luxurious city, which the Military Surgeon does not require? What qualifications, of the head, or of the heart? He has no one to conſult with in the moment in which the lives of numbers are determined! He has no ſupport but the remembrance of faithful ſtudies, and his inward conſciouſneſs of knowledge; nor any thing to encourage him in the many humble yet becoming duties which he has to fulfil, except his own honeſt principles and good feelings.

I know your minds go willingly along with me when I ſpeak of thoſe duties which agree ſo well with the ardent and generous temper of youth. While you are young, enter into the ſervice of your country! It is a ſchool, of practice in your profeſſion of prudence, good conduct, and knowledge in the ways of the world. A young man ripens amidſt thoſe actual ſervices for the important period (to himſelf at leaſt moſt important), when he is to take his permanent ſituation in life. It is a ſchool, where he who has a good education, juſt principles, and a feeling heart, improves in all that can make him beloved or reſpected when he returns home to his friends. And if during his years of ſervice he meet occaſionally with diſtreſs and danger, this too is good. "Sweet are the uſes of adverſity."

The very men who are now the chief authorities in ſurgery, who alone of all the writers of the laſt age are admired and appealed to, were bred in this ſchool. Petit, Garengeot, Dionis, Heiſter, Le Dran, were the army ſurgeons of France, and learned, in the field, that ſurgery from which the trivial books of the preſent day are immodeſtly and poorly copied. Our great ſurgeon Wiſeman was bred amidſt the horrors of our civil wars, ſerving a long and weary apprenticeſhip to that profeſſion in which at laſt he attained to an eminence unequalled by any man ſince his time. Heiſter tells us how he learned his profeſſion. He ſeems to have been a very young man, poorly ſupported, but of unſubdued ſpirit. "Expoſed (ſays he) to many dangers and hardſhips, thus did I ſpend my ſummers in the hoſpitals of the camp for the ſake of improvement." During many years he ſtudied anatomy under Ruiſch, Raw, Albinus, and Bidloo, in the winter ſeaſon, and returned in ſummer to the field, and even after he was appointed to ſucceed his maſter Raw, in lecturing on anatomy; as ſoon

as his winter labours were over, he repaired every year to the camps, and hoſpitals.

It was an enthuſiaſtic deſire of learning his profeſſion that induced Paræus to follow the French armies while yet very young; and we have a ſingular teſtimony of his early abilities from an old phyſician, who, after the taking of the city of Turin, always called for young Paree "when any great ſurgical work was in hand, becauſe he was delighted with the bold and ſpirited manner in which he performed all the great operations." To the Signeur le Mareſchal Montjan this old phyſician ſaid at parting, "My Lord, you have got a ſurgeon young in years but old in experience and wiſdom. Keep him carefully, for he will do you both ſervice and honour." Paree himſelf tells this tale of his early days in the mere garrulity of old age, but along with this ebullition of vanity there is good ſenſe and even modeſty; for he adds ſoon after, "But the good old man did not know that I had lived three years in the Hotel Dieu attending the ſick." Paree began his career in the Hotel Dieu. He performed there many operations upon the living, and learned much of anatomy from the dead body. He perfected himſelf by practiſing in the camps and armies, and having lived in familiar ſociety with the king and nobles of France, he finiſhed a long, honourable, and buſy life, in the city of Paris. It is ſeen in the hiſtory of the French Academy, that the princes and generals of France willingly took the field when they could prevail upon Paree to go out along with them; and at the time when all the nobleſſe of the kingdom were ſhut up in Mentz, which was beſieged by Charles V. in perſon, at the head of 100,000 men, they ſent a ſort of embaſſy to the king their maſter, beſeeching him to ſend Paree to them. An Italian captain, for a great reward, introduced him into the city. They inſtantly ſent at midnight to awaken the prince, who commanded the city, with the good news of his arrival. The governor begged of him that he would go next day and ſhow himſelf upon the breach. He was received with ſhouts of triumph; Mentz was then the bulwark of France; and it has always been aſcribed to the preſence of this ſingle man (ſo perfect was their confidence in him), that they kept the city till the gallant army which lay around it, periſhed beneath its walls.

Who could deſire a more laſting fame than theſe men have left behind them. They followed the armies not for pay nor penſions, but out of pure love for their profeſſion. They ſought improvement, impelled to it by being already thorough-

ly educated in all kinds of ſtudy. Their ſkill was founded on experience, and that again on the ſureſt of all grounds, a perfect knowledge of anatomy. Theſe are the authors who have written with character, preciſion, and truth. Upon minds leſs ardent, leſs improved by ſtudy, the beſt opportunities are but thrown away; therefore let this be a motive with you for unremitting diligence. Be careful to be early and well prepared for theſe important ſcenes, able to do good ſervice to the ſtate, and capable of improving your own minds. At this preſent time you muſt feel chiefly the uneaſineſs of your taſks; it is in your after years that you are to enjoy the proud ſuperiority of a good education.

Above all, improve yourſelves in anatomy. It was by their knowledge of anatomy that Paree, Dionis, Heiſter, Wiſeman, Le Dran, were diſtinguiſhed among hundreds of other ſurgeons in the camp; this was, in their own opinions, the point from which their profeſſional excellency and public character aroſe; a character founded, not on the patronage of the great, nor on high appointments, but on ſevere previous ſtudy. And be it your comfort to know, that they were juſt as you are; it was their own intenſe diligence, and above all their acquaintance with anatomy, the very baſis of our ſcience, which made them the firſt ſurgeons in the chief cities of Holland, England, and France, the beſt authors in their own day, and the higheſt authorities in ours.

Anatomy has always been acknowledged as the baſis of all medical education. In thoſe days when ſurgery had not any reſpectable rank in general ſcience, the phyſicians, who were anatomiſts, taught the ſurgeons. The ſurgeons were but their ſervants, aſſiſtants, and operators. When the ſurgeons began to learn anatomy, their part of the profeſſion began to improve; for it was then only that anatomy and ſurgery, the theory and practice, were rightly combined. In the early days of ſurgery, every book was regularly prefaced with a ſyſtem of the anatomy of the human body; and if this preludium be omitted now, it is becauſe anatomy is become, in itſelf, an important ſtudy. It is not by ſketches and ſlight views, that a ſurgeon can become truly accompliſhed in it. Every one is preſumed to be thoroughly informed in that ſtudy, which contains the elements of ſurgery and of all medical ſcience. Anatomy, I repeat it, is indeed the baſis of medical education, the only one which will be acknowledged by any ſenſible and well informed man. Chemiſtry, phyſiology, pathology, all look back to the ſtructure and functions of the human body, and twine themſelves round this great trunk.

If a ſurgeon ignorant of the parts of the human body, ſhould be called to perform even an eſtabliſhed and regular operation, which he has often ſeen performed; How muſt he tremble at the thoughts of what he has to do! Faultering and diſconcerted! heſitating at every ſtep! Acting only as he has ſeen others act, he is interrupted, ſtartled, perplexed with every new occurrence. He has foreſeen nothing, provided for no accident, and every accident alarms him. He moves fearfully and timorouſly onwards, like a blind man who walks with an air of confidence on an accuſtomed road, but when any new object preſents itſelf, or the road is changed, is bewildered and loſt.

In cities, indeed, we ſee untaught men operating upon their fellow creatures, in caſes of life and death, in aneuriſm, lithotomy, hernia, trepan, without the ſlighteſt knowledge of the anatomy of the parts, much leſs any right ideas of their conditions, and new relations to each other in the ſtate of diſeaſe. But ſuch operators are ſeen agitated, miſerable, trembling, heſitating in the midſt of difficulties, turning round to their friends for that ſupport which ſhould come from within, feeling in the wound for things which they do not underſtand, holding conſultations amidſt the cries of the patient, or even retiring to conſult about his caſe while he lies bleeding in great pain and awful expectation; and thus, while they are making ungenerous ſtruggles to gain a falſe reputation, they are incurring reproaches which attend them through life. But a military ſurgeon cannot even do this. In the time of his greateſt difficulties, he is unſupported and alone. He cannot, when performing trepan or amputation, turn to his ſervants to aſk advice; and if, in dilating a wound, or ſearching for a ball, he cut the femoral artery, or any of its great branches, you know what will happen. In his irregular unpremeditated operations, life is ſaved or loſt by one glance of his eye, and one turn of his hand; he ſtrikes the axillary artery, and his patient is ſafe; he loſes it, and his patient expires!

Thoſe very men who ſit down deliberately to perform operations which they have never tried, if they were requeſted to do any trifling thing in the moſt ordinary matters, would never ſcruple to ſay, I have not tried it! I have not been at the pains to learn it! or, if they had been apprenticed to any ordinary trade, they would practiſe long before they would think themſelves perfect workmen, or fit to perform before others. Yet theſe imperfect workmen in our trade daringly practiſe upon their fellow creature, performing on him, with profane hands, operations which they have only heard of, or perhaps read about! and

that not much! which they have never performed upon the dead body. It looks as if they threw aſide all conſcience, all humanity, all feeling towards their fellow creatures, and ſaid within themſelves, " The blood and the cries will hide every thing that is wrong."

But in this matter, Gentlemen, there can be no miſtake. It is to thoſe only who are ſkilled in anatomy, that we ourſelves would truſt our health in caſe of diſeaſe, or our perſons in any great operation. Even the ill judging world decides exactly thus; for Power, blindfold and undiſcerning as it often is, may put unworthy men into places of truſt and honour; but can it procure for them confidence, and the public eſteem, or that character and laſting reputation which will always, I hope, be dearer to you than mere gain? By being ſo much exalted, they are but the more degraded. " Poor rich men!"

It is this knowledge of anatomy that has made the great ſurgeons of this and other countries reſpected in their own days, and remembered in ours. This conſecrates their works, and marks them with the ſeal of ſterling merit; by this their fame will be preſerved in all times; and while we read their writings with unabating pleaſure, may we not learn to follow them in the ſame honourable path, and, like them, purſue the true way to be great in our profeſſion?

No ſooner do you take up the works of any author, and read them with proper diligence, than you perceive, from the very forms of his books, the order and character of his ſtudies. If he be a man unlearned in his profeſſion, and have (as is but too much the cuſtom), learned it by hearſay only, his tedious unmeaning books will be ſoon thrown aſide, they will indeed ſeldom fall into your hands. But if he be a perfect ſurgeon, like thoſe whom I delight to ſet before you as examples; then you will find all his remarks arranged, explained, illuſtrated, and enforced with peculiar ardour; his perfect knowledge of the human body brings all his experience into the moſt uſeful forms; his hiſtories are plain and important; he dwells with judgment upon thoſe points which are peculiarly difficult, and reſolves them, by continual reference to the ſtructure and functions of the parts. The moſt ſurpriſing caſes become credible, when he relates them; the moſt ordinary facts become inſtructive; we never read ſuch an author without pleaſure as well as inſtruction; at every turn, in every difficult queſtion, we perceive his ſuperior penetration, knowledge, deciſion, good conduct. But far otherwiſe is it when we read the books of ſome others, whoſe

hiſtories are merely ſurpriſing tales, to which the want of anatomical knowledge, gives an air of idle romance.

Pathology, or the diſeaſed ſtates of the human body, muſt alſo be with you a principal ſtudy, for that will ſerve as the baſis of well founded confidence in yourſelves, and of inexhauſtible reſources in occaſions of difficulty or preſſing danger. Do not let any man perſuade you that theories are of no avail. The comparing of diſeaſes and wounds with the natural form, ſound conſtitution, and healthy actions of the part, forms a kind of theory which will not deceive you; and while you are ſtudying ſuch ſubjects, you are digging for the hidden gold which you will ſurely find, though not in the exact place or form in which you expected to find it.

General theories indeed are often but the works of idle men, of thoſe who want induſtry or knowledge for ſearching into particulars, who are hurried away by an imagination too rapid, and too fervent to be uſeful, in a profeſſion like ours; of men "who fill their books with toys, and lies, and vain conceits." But particular points ſhould be ſtudied by the young ſurgeon with unremitting diligence; and he who has a command of particular points, who has ſo combined anatomy and pathology, that he can revolve each caſe, and each accident of a caſe, in his mind, till it become quite plain and eaſy to him; will not fail to have a formed and habitual taſte for great and general views; and an intelligence in all the great points of his profeſſion, far excelling, in ſound ſenſe, and ſober uſefulneſs, the wild unfounded conceits of profeſſed theoriſts.

Pathology is the work of the mind operating upon facts, comparing the ſound and healthy ſtucture with the ſtate of diſeaſe. Every man will reaſon well and truly, in exact proportion to his acquired knowledge, and will act with ſenſe and prudence, in exact proportion to his ſound reaſoning. The moſt uninformed reaſon according to their degree of knowledge. They reaſon ſeldom indeed, and their minds are not much engaged; they are never warmed by love of their profeſſion, their exertions are without enthuſiaſm. But if you put in motion one whoſe mind is improved by ſtudy, and ripe for practice! his powers riſe in every perilous or agitated ſcene; his mind, even in the midſt of confuſion, and while he is buſy with his hands, is turning continually from point to point, from ſpeculation to ſpeculation. His reaſoning is rapid and ſure. It is like inſtinct, direct, active, effectual. He thinks, judges, reſolves, and acts at once. He reaps advantages from pathology, which (in the time of

his ſtudies) he did not believe to be ſo cloſely allied to practice; he goes onwards with an intrepidity, ſecurity, and firmneſs, which he is delighted to feel. It is in the midſt of theſe ſcenes of difficulty that ſuch a man, ſo educated, ſo inſpired, comes to be truly known.

Anatomy and pathology are ſtudies to which you will be eaſily perſuaded to direct your attention; and you find indeed in every book ſome inſtruction on theſe points. But the very higheſt ſtudy of all, I mean the HISTORY OF OUR SCIENCE, is much neglected. I know that you are well prepared to receive ingenuouſly, in ſincerity and kindneſs, whatever I have to ſay to you on theſe intereſting ſubjects; and therefore I will mention to you, that it is too much the temper of our times to be ſatisfied with ſuperficial and imperfect ſtudies; with ſuch ſcanty gleanings of knowledge as are to be gathered from mere ſchool books, and from the mouth of a teacher. Indeed, it is with us now as in thoſe times when books were ſcarce, when printing was not yet invented, when a ſingle phyſician preſided over a whole country, and having acquired a reputation, perhaps by ſome extravagant fantaſtic doctrine, was enabled to gather round him a number of young men, and thus he formed a ſchool, whoſe dogmas altered not; whoſe pupils were not allowed to range beyond that magic circle which their maſter had drawn round about them. I believe I do not judge too hardly when I ſay, that by all appearance there are many, in the preſent day, who are contented to learn the moſt arduous of all ſciences "by hearſay and report!" by talking about it! by walking the wards of hoſpitals, or lounging through the claſſes of a college, and by hearing and repeating the news of the paſſing day. This ſcanty and vulgar kind of knowledge is but ill calculated to inſpire a man with the love of his profeſſion, or make him really deſerving of confidence and reſpect. Remember that ſevere reproach with which Van Horne brands the name of ſuch an author, De Saporta ſupra dictum eſt, nihil illum ſapere, præ vulgo *.

But I am to explain to you the importance of ſtudying the hiſtory of our ſcience. We have lying before us, challenging us to diligence, all the ſucceſſive improvements of two thouſand years. The ſtudy of theſe calls into action every faculty of the mind, fertilizes the invention, ripens the judgment, and makes us really fit to decide upon the modes and practices which are to be preferred. By this exerciſe of the mind we become familiar with difficulties; for while we

* Microtechne, p. 528.

are ſtudying the hiſtory of ſcience, all the moſt nice and important points are preſented to us again and again, and diſcuſſed by various judgments and in various forms.

The truth is, that the practices and the prejudices of the old times mix themſelves with the more orderly and perfect operations of the preſent day; and this is a ſubject of ſtudy which we muſt not neglect. We have now leiſure to obſerve, how ſlowly diſeaſes have been underſtood, or operations invented or improved; we can remark how ſlowly and how imperfectly anatomy has been applied even to this day; at this moment we are employed in rooting out the prejudices and barbarous practices of thoſe Gothic times! For the practice of the older ſurgeons was marked with all kinds of violence; an indifference about the ſimple cure of diſeaſes; and a paſſion for operations, as the cutting off of limbs, the ſearing of arteries, the ſewing of bowels, the trepanning of ſculls round and round, and all the exceſſes and horrors of ſurgery.

Is it not moſt unaccountable to ſee men among us expecting to excel in a profeſſion which they have not ſtudied? eager to be known as improvers without having ripened their minds by ſtudying the inventions of others? vain of their opinions, practices, and pathologies of diſeaſes, in which they are often excelled and anticipated by authors which they have never read? Many a buſy creature do we ſee proclaiming as fine inventions of his own! inſtruments or operations which have been deſcribed, drawn, commented upon, condemned, neglected, and revived again, centuries before this new inventor of old things, was himſelf born. While he troubles the world with his novelties, he has every fault but that of deſigning ill, or committing any wilful plagiariſm; he is innocent of the knowledge of all old inventions. Whoever has thus neglected to ſtudy the hiſtory of our profeſſion, has a narrow mind, and prefers the little opinions of his particular maſter, to the accumulated wiſdom of ages; he dwells with enthuſiaſm upon thoſe theories which have taken firſt poſſeſſion of his mind, and never is he able to emerge from the atmoſphere of the particular ſchool in which he was bred.

It is to be obſerved, that ours is a profeſſion which is diſgraced with more ignorance and error, extravagance, fanaticiſm, and nonſenſe, than is to be found in all the circle beyond it, whether of ſcience or of common life; and it is by this ſtudy of its hiſtory that juſt principles are to be eſtabliſhed, miſtakes corrected, and prejudices done away; even to underſtand the common matters, we muſt enter into

the details of ſcience; and while I lead you through "all the laughable and all the loathſome familiarities" of our profeſſion, it muſt not be always in a ſolemn and ſerious mood. Every ſubject has its appropriated language, and it is not more truly the mark of wiſdom to be grave on ſerious occaſions, than it is the ſign of folly to affect the ſame unaltered gravity on occaſions where we may lawfully be amuſed as well as inſtructed. There is in the hiſtory of our ſcience much to amuſe us, but there is much alſo to bring us back to a ſober, thoughtful ſtate of mind, and I hope there is no man more apt to be ſeriouſly impreſſed with ſerious matters than I am. As your teacher, it becomes me to addreſs you in that language which the occaſion requires, with familiarity ſometimes, but more frequently with the ſeriouſneſs of an earneſt friend! When I tell you to deſpiſe authority, I ſhall at the ſame time teach you to reſpect ſcience, and to cheriſh in yourſelves a love of truth, an ardour in ſtudy, a proud opinion of your profeſſion, and a ſincere diligence in all the duties of it.

Much has been ſaid about the qualifications of a ſurgeon, as if nature had not endowed us all with abilities equal to the common and neceſſary duties of life. On this favourite theme, however, authors have deſcanted to little purpoſe, for thoſe qualities which are moſt loudly praiſed, are ſuch as cannot be acquired, and have little relation to the abilities, dexterity, or knowledge of a ſurgeon. The elegant deſcription of Celſus is not judicious, although it ſuits the times in which he wrote: when ſurgeons were chiefly the ſervants of phyſicians, who required of them chiefly a quick eye and a ſteady hand, and that unfeeling hardihood, which is ſo well deſcribed by the "manu ſtrenua ſtabili nec unquam intremiſcente, animo intrepidus immiſericors." By ſuch deſcriptions ſurgeons are diſgraced not praiſed, and the modern ſurgeons, in repeating this deſcription, have but caricatured the claſſic picture of Celſus. The bonam formam, oculos claros, manus firmas, digitos graciles of thoſe Gothic ſucceſſors of Celſus, are rather directions for chooſing a nurſe or paramour; yet many an awkward fool, when he was writing ſuch ſilly things, thought he was deſcribing "his own fine parts and pretty perſon."

I would have you to dwell with confidence on this, that all that is eſſential to the character of a good ſurgeon may be acquired. To think otherwiſe, were as diſcouraging as untrue. The eye is in the mind. A learned eye is a diſcerning and a quick one. And his hand will not eaſily tremble who knows perfectly what the hand ſhould do! what the hand may do! Study well the eſ-

ſentials of your profeſſion, learn your duties and truſt the reſt to nature. For be aſſured that dexterity and boldneſs follow judgment and ſkill as cloſely as the ſhadow does the ſubſtance. Though the qualifications of a ſurgeon are not to be acquired, yet aſſuredly they may be improved; and he will be diſappointed who waits for a ſort of inſpiration, and expects to find in himſelf naturally and without practice, a quick reſolution, a judicious eye, or a dexterous hand. He may believe himſelf dexterous without knowledge, but it will be mere whiffling agility and charlatan trick, in place of maſterly and deliberate boldneſs.

But boldneſs is a ſeducing word, and the paſſion of acquiring character in operations is ſurely full of danger; it is fit for thoſe only to profeſs, who have no higher claim to the public eſteem. We are but too apt to allow the audax in periculis to be the character of a good ſurgeon. But this is a temper of mind and a line of conduct which can benefit nothing but the character of the ſurgeon himſelf; for as to his patient, this ſhameleſs thirſt of fame! this unprincipled ambition, is full of danger. I would ſay rather with Guy De Chauliac, Sit audax in ſecuris, timidus in periculis; let him cut rapidly and dexterouſly where all is ſafe, ſlowly and cautiouſly where there is danger. He ſhould not, where quickneſs can do no harm, torture his patient and protract his pain with fooliſh and conceited tricks; ſuch affectation of dexterity is but a pitiful ambition in thoſe who uſe it. Nor ſhould he in any doubtful caſe endanger his patient merely to gratify the fools who eſtimate his dexterity by no other criterion than the ſtop-watch; the patient commits himſelf into the hands of his ſurgeon, conſtitutes him judge in all difficulties; and would willingly endure a more ſevere and lingering operation if there appeared circumſtances of peculiar danger. Should not then the preſent ſuffering of the patient, the ſenſe of his own duty, and above all the truſt that is repoſed in him, occupy the ſurgeon's mind too much to leave room for vain or ſelfiſh thoughts? Yet we every day ſee ſurgeons cutting out harmleſs tumors with affected and cruel deliberation, and in the ſame hour plunging a gorget among the viſcera with unrelenting raſhneſs.

Believe me, thoſe qualities which relate to operations and other public exhibitions of ſkill, are of a very doubtful kind, while the duties of humanity and diligence are far more to be prized; they are both more amiable and more uſeful. For an example of this, and of every thing great in our profeſſion, I go at once to Paree, who was more humble, more charitable, more affectionate towards the poor, than (it is to be feared) thoſe who live with kings and princes uſually are:

for Paree was the familiar companion of princes, and yet was not careleſs of the pooreſt fellow that followed in their train. In what I am now going to relate to you, you will learn how much a ſenſible, active, humane ſurgeon may be able to do for a very miſerable creature, even after he is abandoned by his fellow ſoldiers.

" A poor ſoldier," ſays Paree, " in the train of the Mareſchal de Montjan, at Turin, was wounded near the wriſt with a muſket ball, and the arm fell into gangrene, the ball having lacerated the tendons and ligaments, and ſhattered many of the bones."

" The gangrene extended to the elbow, the mortification (or leſſer degree of gangrene) extended to the ſhoulder, and that ſide of the breaſt was highly inflamed. He had hiccup, faintings, reſtleſſneſs and other threatening ſymptoms of approaching death, ſo that he was abandoned by his ſurgeons; and his friends prevailed upon me to viſit him in this condition. Seeing the mortification, I ventured, according to the rules of art, to cut off his arm at the elbow, tying it firſt firmly with a fillet, then cutting acroſs the ligaments of the joint, then allowing the veſſels to bleed, then ſecuring them with cauteries, BECAUSE AT THAT TIME I KNEW NO BETTER PRACTICE: And then, undoing the fillet, I made ſeveral large and deep inciſions into the gangrened arm, avoiding the innerſide of the arm on account of the great artery and the numerous nerves, and then I cauterized ſeveral of the inciſions, both to ſtop the hæmorrhagy, and to dry up and deſtroy the gangrenous and poiſoned fleſh."

" I ſupported him, and defended the heart from the poiſon carried to it along the arteries by cordials. But, on the 15th day, this poor man was taken with a ſtrong convulſion, which I had foreſeen, for it was extremely cold; and he was miſerably laid in a granary, poorly covered, and expoſed to every wind, without fire, wanting alſo all the other neceſſaries of life."

" The limbs were diſtorted, the mouth and face were alſo diſtorted and retracted, as in the riſus ſardonicus. I was moved with pity, and extremely anxious to do my duty towards him. At ſuch a time I could do nothing better for him than place him in a ſtable, amidſt a great number of cattle, and lay him in warm dung. I then got ſome chaffing-diſhes full of live coal, which I placed near him. I then had his legs, arms, and nape of the neck, rubbed with antiſpaſmodic oils and balſams. I then wrapped him well up, placed him cloſe by the burning chaffers, and there he lay without moving for three days, and three nights, during which time he had a ſlight diarrhœa, and

at the ſame time a heavy ſweating. Then his mouth began to open, I helped it with the dilator for opening the locked jaw, and ſlipped in a little button of willow-tree to keep it open. He could now ſwallow, but of courſe could not chew; ſo I nouriſhed him up with cows milk and eggs, and ſo cured him of the ſpaſm. I finiſhed the cure alſo by applying the burning irons from time to time to the bone; in which the patient delighted very much, for when the burning irons were applied, he ſaid he felt a ſort of titillation running along the bone; a circumſtance which I have often obſerved in ſimilar caſes in the Hotel Dieu. The bone threw off great ſcales. Thus God and Nature inſtruct us to preſerve our patient even when the mortal ſymptoms have come on. "Contingent in morbis monſtra ſicut in natura *."

When a man enters upon ſuch duties as theſe, he ſhould be diligent, watchful, and laborious; humane, friendly, and ſelf-denying; full of unceaſing anxiety for others, and a noble diſregard of himſelf. We will not define the chief qualities of a ſurgeon, in this cold-hearted way, of perſonal and ſhowy accompliſhments; mercy and tenderneſs towards his patients, and every kind of charity, are the chief virtues and moſt becoming ornaments of a ſurgeon. He muſt not be wearied out by the tedioufneſs of his patient's ſickneſs, nor provoked by the irritation of ill judging and officious friends. He muſt not ſhow himſelf reſpectful and attentive to the rich only, nor careleſs of the poor becauſe they are ſo. If ſometimes an operation be required, let it be done rapidly where

* Another anecdote in Paree ſhows rather the rudeneſs of the times than the unavoidable horrors of war: The army was ſadly preſſed with hunger and want, ſo that he himſelf, with plenty of crowns in his purſe, was for three days very near ſtarving. A party had gone out to attack a church (where the peaſants of the country had fortified themſelves), hoping to get ſome booty of proviſions, but they came back very ſoundly beaten; and one eſpecially, a captain-lieutenant of the company of the Duke de Rohan, returned with ſeven gaſhes on his head, the leaſt of which penetrated through both tables of the ſcull; beſides four ſabre wounds in the arm, and one acroſs the ſhoulder which divided one half of the ſhoulder blade. When he was brought to quarters, his maſter the Duke judged him to be ſo deſperately wounded that he abſolutely propoſed (as they were to march by day-light), to dig a ditch for him, and throw him into it, ſaying, "that it was as well that the peaſants ſhould finiſh him." But, being moved with pity, I told him, ſays Paree, "that the captain might yet be cured." Many gentlemen of the company joined with me in begging, that he might be allowed to go along with the baggage, ſince I was willing to dreſs and cure him. This was accordingly granted; I dreſſed him; put him into a ſmall well-covered bed in a cart drawn by one horſe. I was at once PHYSICIAN, SURGEON, APOTHECARY, and COOK to him. And thank God I did cure him in the end to the admiration of all the troops; and out of the firſt booty the MEN AT ARMS gave me a crown a-piece, and the ARCHERS half-a-crown each.

there is no danger; but where there is any thing doubtful, let it be done ſlowly. If there be a tedious lingering diſeaſe, the ſurgeon muſt be every thing to his patient; watchful, friendly, compaſſionate, cheerful; for the patient lives upon his good looks; it is when his ſurgeon becomes careleſs, or ſeems to forſake him, that he falls into deſpair. The ſurgeon muſt be eſpecially careful of every thing that may conduce to his patient's comfort; of ſupporting his ſtrength, when it ſeems to flag, with wine and medicines, and of comforting him with anodynes and cordials when he ſees him in pain. The ſurgeon muſt preſs out the matter cautiouſly from the deep ſores, and draw the ſetons every day, with his own hand, to prevent new collections being formed and new ſores. A ſhattered limb he will extend carefully on oil cloths; and will waſh it often himſelf, becauſe cleanlineſs and comfort are of the firſt importance in preſerving the health; and well he knows how careleſs nurſes and other attendants are. Indeed nothing can more encourage them in their duties, nor leave them ſo entirely without apology if they fail, as ſeeing from time to time the moſt unpleaſant things done by the ſurgeon himſelf. The ſurgeon muſt be ready to propoſe conſultations upon any appearance of danger. He muſt learn to ſubmit with a good grace, when he is aſſaulted with the foreſt of all affronts, the want of confidence in the patient himſelf, or the impertinence of friends. Such is the imbecility and weakneſs which attends on long confinement, that every one wiſhes at times for a change of men and meaſures; and though conſcious of the folly of what he deſires, yet he cannot ſuppreſs that wiſh, which, being once indulged, his good ſenſe and gratitude ſoon return.

Theſe are among the chief duties of every ſurgeon, his daily occupations. But the duties of a military ſurgeon are ſuch in the time of battle, that it is difficult to imagine how he has fortitude for ſuch a ſcene. While others have things to do daring and ſpirited, ſuited to the time; all his works require deliberation, judgment, and perfect compoſure; he alone ſits at a diſtance from the work of war, and all the hideous ſights have their full effect upon his mind. And yet there are things ſtill worſe to bear than the natural, inevitable, horrors and hardſhips of ſervice; ſlights, loſſes, diſappointments and unmerited neglect! by thoſe too, whom the ſurgeon has ſerved, and who ſhould be the natural guardians of his intereſts.

Mr. Aitken, in his Navy Surgeon, tells of a deſperate wound which his captain had received in a battle at ſea, and with how much difficulty he was able,

after cutting off his arm, to ſave his life. But, far from being rightly impreſſed by the ſufferings of his captain, he breaks out into the following mean ungenerous expreſſions: "I watched over this gentleman, the Honourable Galfridus Walpole, brother to our miniſter of ſtate, for two or three nights immediately ſucceeding the operation, though I had at that time forty wounded men to care for, ſuppoſing that tenderneſs and reſpect would enſure his good opinion, and conſequently his intereſt. But notwithſtanding all this, and all my future fatigue and extra work, he remained as calm and undiſturbed as Burnet's devotée, never gave me a glaſs of wine or thanks for it (the reverſe of his brother, loving cheap jobs). I muſt add, he ſuffered me to pay for him for making up Dr. Morton's preſcriptions for him at Leghorn and Genoa, a proof of that thin and avaricious diſpoſition which gave me ſo much trouble in his cure." Can any thing be more pitiful, ungenerous, unlike a gentleman than this is? Can any thing more degrade the profeſſion, or diſgrace the man? But I will refrain from any reflections on this, nor will I do you the diſgrace to ſuppoſe you wanting in juſt offence, at ſeeing your profeſſion thus diſhonoured. It is enough that I hold this culprit up to your indignation and contempt. But if ever, in after life, you ſhould at any time think yourſelves injured or neglected, remember with what ſevere contempt you firſt heard of this manner of complaining. Reſpect yourſelves, deſerve well of your country, and all thoſe who are around you will be ſenſible that you are deſerving; refrain from complaints, which will but harden your enemies and diſguſt your friends.

# DISCOURSE II.

## HISTORY OF THE DOCTRINE OF ADHESION.

To paſs at once from ſtudy to practice, from the mere reading of books to the moſt dangerous operations upon the living body, is an alarming ſtep; it fills us with anxiety to think of it; and very ſeriouſly ſhould we reflect upon the courſe of our ſtudies; where one wrong ſtep leads us into labyrinths of difficulties, and our time, our ſtrength, and our patience, may be waſted in an unavailing ſtruggle; even our love for our profeſſion may yield to obſtacles which are unexpected and unnatural.

Of all theſe difficulties, I know of none ſo diſcouraging to the eager ſpirit of a young man, as the too early attempt to procure a knowledge of practice. To be accompliſhed for practice is to have a mind ſtored with all kinds of knowledge; and a young man ſhould gradually riſe through all the dependencies of ſtudy; ſhould paſs through the hiſtory of his profeſſion before he can be capable of underſtanding thoſe concluſions which we call rules of practice. He muſt know whence thoſe rules have ariſen, why they have been changed, how they have been improved. He ſhould know the period at which each intereſting practice began, in what countries it has prevailed, and by what authors, and by what kind of reaſoning, each rule in our general code is ſupported. For each rule is to be received with limitations and exceptions, with a degree of diffidence or confidence proportioned to the authorities and proofs which it brings along with it. To deliver rules, unqualified and abſolute rules, into the hands of an untaught man, were to put a two-edged ſword into the hands of an idiot.

Who is there ſo humble, as to be willing to practiſe an art which he does not underſtand, or to move according to rules which he cannot explain? rules which are not the reſult of his own particular knowledge, but the dogmas of others, the opinions of ſchools and writers whoſe works perhaps he knows not! of whoſe doctrines he is ignorant! whoſe practices he is to follow with a mean and ſlaviſh deference!

Rules of practice form the ſum total of our knowledge, but they are not the means by which knowledge is to be acquired. They enter ſlowly into young minds, and have but a ſlender hold on an imagination unheated, unoccupied with the ſubject, unconſcious of the ſlow and gradual changes, the ſilent but important revolutions by which ſcience has been improved. The rules which I ſhall require you to learn ſhall be founded on hiſtories, theories, and facts. You ſhall not follow with ſervility the practice of myſelf or of any maſter; your opinions ſhall be your own, the reſult of your own particular knowledge. I know both how to reſpect the difficulties and uncertainties which you muſt feel when firſt entering on ſtudy, and how to lead you onwards to a general knowledge of your profeſſion by ſlow and gradual ſteps; and as for the abſolute rules of practice, I will not play the pedant over you, but give you a due ſhare in forming them for yourſelves.

You may depend upon it, that wherever there is a difference betwixt ancient and modern ſurgery, there is alſo a connection of infinite uſe to us if we could find it out; and it is by ſtudying theſe connections that we are enabled to give a good account, not merely of the uſeleſs antiquities of ſurgery, but of the excellencies of modern practice: I have alſo obſerved, that where there exiſt any very ſingular prejudices connected with our profeſſion, they have firſt ariſen among the profeſſion, though now perhaps they are to be found only among the vulgar and when there have been ill reports among the vulgar concerning the practices of medical men, they are ſeldom entirely void of truth.

In the treatment of wounds ſurgeons were at one time really very rude and cruel; they abſolutely delayed the cure. They never allowed the lips of a wound to fall together, they filled it with dreſſings and acrid balſams, or diſtended it with tents and leaden tubes. They were ingenious in every invention to prevent its ſudden healing. "The chief method of healing wounds, and the moſt reſpected," ſays Phiocrovant, "is that called Canonico, in which there be four operations: The firſt is digeſtion; the ſecond is mundification; the third is incarnation; and the fourth is cicatrization. Every wound was forced into a painful ſuppuration, which the ſurgeons of thoſe days were careful to encourage in proportion as the wound ſeemed more inflamed. The quantity of matter was again an argument that the wound needed to be thoroughly purged of its foul humours. The pain of a wound and the waſte of ſubſtance was very great, under their management, the cure was proportionably ſlow, the ſcar was broad and un-

ſightly; but they comforted themſelves by ſaying, that this method alone was ſure, and conſiſtent with the rules of art. Thoſe few ſurgeons who ventured upon the cure by direct and immediate adheſion, went fearfully and timidly to work. They were in continual apprehenſion of ill accidents; and having failed to comply with the canonical or regular method, having neglected to purge the wound, the patient never ſuffered the ſlighteſt alteration of his health, even at the diſtance of years, which was not imputed, either from malice or ignorance, to this ſudden and improvident cure. This was the real origin of the ſecret dreſſings; and nothing can be more ſingular than the various inventions which ſurgeons, in thoſe days, fell upon, to perſuade their patients to let their wounds be eaſily healed, and, at the ſame time, protect themſelves from blame. Indeed, when we conſider the continual proteſtations made by La Motte and other good ſurgeons of their never having, for the ſake of gain, uſed any tents or injections to protract a cure, we cannot baniſh from our minds ſome very unpleaſant reflections. For while theſe authors enter their proteſt againſt the general conduct of other ſurgeons, and ſhow their anxiety to proclaim their own innocence, we cannot but ſee that they point at ſome practices and motives of conduct which we fain would not believe. In thoſe days, every flap of ſkin, inſtead of being reunited, was cut away; every open wound was dreſſed as a ſore, and every deep one was plugged up with a tent, leſt it ſhould heal. Tents, ſyndons, ſetons, leaden canulas, and ſtrong injections, were among the chief violences of ancient ſurgery. And no man wiſhing to treat his patient MORE CANONICO, or by that rule which alone could vindicate him to the profeſſion, no man, I ſay, who regarded his own character, went without this cruel apparatus of tents and ſyndons when he was to dreſs even a ſlight wound. The old ſurgeons never put the lips of any wound together; if it was not large and free, their rule was to dilate it, but never with the knife; with a ſort of forceps they tore it open; they ſeldom made counter openings to let out the matter; they never ſought to put an end to the formation of pus, and the waſte of the fleſhy parts, but encouraged the ſuppurations. They plugged up the orifice in order to dilate it. They made their tents long that they might convey acrid medicines to the very bottom of the wound. They forced the ſuppuration in order to prepare it for the ſecond ſtage of their proceſs, viz. incarnation. They prevented the natural and eaſy flow of the matter that they might have the ſatisfaction of ſeeing it ſpout out in great profuſion when they withdrew their tent. They oppoſed their own

ways always to thoſe of nature, and liked nothing which was not done by main force of ſurgery. This is what I mean when I ſpeak of their coarſe and cruel practice; tents, ſyndons, ſetons, leaden canulas, may all be uſed with advantage; but I am now obſerving only how they were abuſed; for no wound eſcaped this violence; and the practice of an ancient ſurgeon was exactly the ſame with that by which beggars counterfeit ſores, or rather convert accidental wounds into perpetual ulcers. The moſt ſimple wounds of the limbs were frequently tortured by the old ſurgeons into the form of malignant ſores, running for many months; wounds of the great cavities were always diſtended with tents to the imminent danger of the patient; if he ſurvived, there remained fiſtulas which would never heal; the ſores ran more or leſs according to his ſtate of health, or the ſeaſon of the year; and a man wounded in the cheſt wore his leaden canula for life. "But that which ſurpriſes me moſt of all," ſays an old author, "is to find the afflicted perſons brook the inconveniences they ſuffer with a ſort of ſatisfaction."

The old ſurgeons thruſt their tents into all wounds, both thoſe which were in danger of healing and thoſe alſo which could not heal. They thruſt them into gun-ſhot wounds, of which, if they had underſtood the nature, they could have been under no apprehenſion of their healing ſuddenly, ſince the whole courſe of a gun-ſhot wound is mortified, and the parts through which the ball has paſſed being effectually killed, muſt be thrown off in ſloughs. They thruſt their long tents into the neck, or even into wounds of the cheek, till the neck or head ſwelled monſtrouſly. Even in compound fractures, they thruſt them deep betwixt the ends of the broken bones, as if they had been afraid leſt a callus ſhould form. They introduced their tents even into the cavities of the belly and breaſt. They never trepanned the ſcull where there was inward ſuppuration, without thruſting a tent into the ſubſtance of the brain itſelf, though ſometimes they were contented with laying in a ſyndon, or ſlip of linen. We cannot wonder that theſe things were done by ordinary ſurgeons, men of low education, mere curers of wounds, who dared not to think for themſelves, nor act otherwiſe than according to the ſtrict rules of ſurgery; but what muſt be our ſurpriſe upon finding an author like Veſalius writing in the following manner: "Modus autem ſive forma turundarum equalis ex linamentis debet, ex aliis vero materiis in modum Claviculi Lignei quem latini impagem vocant *." This amounts nearly to the deſcription

* Chirurgia Mag. p. 1002.

given by La Motte, of ignorant ſurgeons making tents as hard, and as long, as the firmneſs of the materials, or the deepneſs of the wound, would allow; twiſting and thruſting them in with the fingers and thumb. "Often I am ſure," ſays La Motte, "I have ſeen thoſe who would have been very willing to have taken the help of a mallet to drive in their tents into the thorax. It was from ſhame only that they refrained." In my young days, ſays Belloſte, when I frequented hoſpitals, and practiſed with very able ſurgeons, I have ſeen, at the time of the dreſſing, the tents for the moſt part expelled from the wounds in ſpite of the bolſter and bandage."

In France thoſe practices were carried to more extravagant lengths, in proportion as our profeſſion was in that country in lower repute, and its profeſſors leſs perfectly inſtructed. Belloſte was the firſt reformer who aroſe in that country; and I refer you to his book for ſome very extraordinary facts. In one ſoldier, who was wounded quite acroſs the belly by a ball, which entered near the navel, and paſſed out through the kidney, he found that the wound inflicted by the ball at entering, had healed in ſpite of all the ſurgeon's diligence; but the poſterior orifice where the kidney was injured, the ſurgeon had contrived to keep open with a very long and hard tent, which he had thruſt even into the ſubſtance of the kidney, occaſioning a perpetual flow of urine from the part. This fiſtula Belloſte cured by drawing out the tent, eating away the callous edges of the ſore with cauſtic, preſſing its lips together, and injecting occaſionally ſome vulnerary water.

Even the joints were not ſpared. In the ſame war, Mr. Belloſte attended an officer who had been wounded in the knee, and had been dreſſed by his own ſurgeon, ſkillfully enough, according to the faſhion of thoſe times. But, fortunately, at the end of four months, his own ſurgeon was obliged to go away; and Mr. Belloſte was called in, and found in the knee ſix fiſtulous holes, each hole ſpiked up with a hard tent, and each tent long enough to reach to the bottom of the joint. The leg and foot were exceedingly ſwelled, and the body proportionably emaciated. The patient had a hectic fever, perpetual watchfulneſs, inſufferable pain, and a loathing of all kinds of food. The whole joint was ſurrounded with matter, the gutter leading backwards from each fiſtulous ſore communicated with ſome adjoining hole, and the dreſſers had every morning ſtopped up the reſt of the openings with their fingers, while they injected, by ſome one hole, a ſpirituous tincture, which diſtended the whole knee with

intolerable pain. The firſt night of ſound ſleep which the patient had enjoyed from the day of his wound, was that in which Mr. Belloſte dreſſed him in an eaſy way; and ſuch was the impreſſion this relief made upon him, that in the morning, amidſt all his friends, he embraced Mr. Belloſte as one who had ſaved his life: and indeed he was entirely recovered in a month.

France was the ſchool in which all our old ſurgeons were taught their profeſſion: and we find, from the book of Colbatch, (a man who volunteered in our armies in Flanders in a very extraordinary manner), that in this country the ſame rude and cruel practices prevailed. Among his cures, is one of a poor ſoldier "who was wounded with one muſket ball which entered at the corner of his right eye, and paſſing through the os ſpongioſum, or ſpongy bone of the noſe, came out at the left eye, tearing that eye all to pieces; while another bullet, entering at the ſame orifice, paſſed through the upper mandible, or jaw bone, and came out at the corner of the under jaw. Thoſe two wounds were crammed as full as they could hold with hard doſſils dipped in ſpirits of wine, which I ordered, ſays Colbatch, to be pulled out; and although this was done with the greateſt difficulty, and put the poor creature to moſt intolerable pain, yet his bravery and undauntedneſs of ſpirit were ſuch, that he never even ſmayed at it all the time it was doing. The ſurgeon had, as he ſaid, pulled out all the doſſils, and dreſſed the wounds with my powder; but our injections, though they paſſed through the one bullet wound, would not paſs through the other; wherefore I concluded there muſt be ſtill ſome doſſils behind; but the wound being very deep, we could not come at ever a one with the forceps. The poor man's head and face were ſwelled to ſuch a degree, that he looked like a monſter. But about the twelfth day after, while the army was on their march, and he along with them, Mr. Cholmondely having taken off the dreſſings to apply freſh ones, a doſſil of the thickneſs of a man's thumb came out, and in a little time his wounds were all cured *." "In thoſe days, nothing was to be heard in the hoſpitals at the time of dreſſing but howlings and cries." "There are ſome ſurgeons, ſays Belloſte, who do not think they have acquitted themſelves as they ought, unleſs they have made thoſe under their hands roar out, which makes ſome people to judge that SURGERY and CRUELTY are INSEPARABLE †." In thoſe days the tenting of a wound was the whole ſurgery of a wound, without which it was imagined to be impoſſible for it

* Vid. Colbatch's Tracts.

† Vid. the Hoſpital Surgeon, p. 35.

to heal. Our great poet had no curſe more dreadful to put into the mouth of the old king than this, " Th' untented woundings of a father's curſe pierce every ſenſe about thee *."

Among thoſe who wrote againſt this rude and violent practice, I might number all the oldeſt and moſt reſpectable ſurgeons. But although Paree ſays, God knows the pleaſure and profit too I have enjoyed from uſing tents more ſparingly †, no one was bold enough openly to declare his intention of joining the lips of a wound by direct adheſion. A man propoſing ſuch romantic doctrines, directly and openly, would have been held in high contempt by the learned; but if he was bold and cunning enough to give an air of incantation to his cures, or to declare that they were performed by a ſecret philoſophical ſympathy known to himſelf only, or to other very learned men, then he was ſure of rouſing at leaſt one half of the learned world to combat in his cauſe. We find indeed no one ſympathetic cure which is not performed plainly by procuring a ſpeedy agglutination of the wound; nor one ſurgeon in Europe who ventured to unite wounds directly by adheſion, without pretending to have learnt from ſome eaſtern ſage, or to have found out by deep ſtudies in philoſophy and alchemy, a ſympathetic, or, as they often called it, a philoſophical cure of wounds.

The firſt inventor of the ſympathetic powder was the celebrated Paracelſus; and the firſt who publiſhed this ſecret to the world was one Ericcius Mohyus of Eburo, who put forth a little book; " but in that book, ſays Van Helmont, he hath neglected the detective faculty or virtue which may bring the virtue of the ſympathetic powder, received in the bloody towel, into the diſtant wound ‡."

* Dr. Jackſon of Exeter has taken up the trade of the black letter dogs; and in his criticiſm on this paſſage tells us, that it ſhould be written as it was heretofore, Th' untender woundings of a father's curſe; that it is printed ſo in the old editions very plainly; and that it would be waſte of time to ſhow the propriety of this. " There is no ſuch word," ſays Dr. Jackſon, " as untented." Now, to tell us that curſes are untender; that a father's curſes are untender; and that the curſes of a father, poured out in the agony and bitterneſs of his ſoul, are untender, is rather ſuperfluous. But the irremediable woundings of a father's curſe, a wound ſo deep that no ſurgery can cure it, is ſomething. To ſay untented, is as natural as to ſay unanointed, unanealed.

† Page 209.

‡ This much celebrated author Van Helmont, he who with great benignity dedicates his book to God Almighty, is the panegyriſt of Paracelſus, and his methods of cure. His dedication begins, Omnipotent, Eternal, Incomprehenſible Being. And concludes, So, O Lord! I caſt down this poor dedication before thy moſt mighty throne; and do thou, O my Interceſſor, offer up this my work to the Holy Trinity, where-

The Paracelſian doctors flouriſhed in England when Dr. Charleton wrote his Ternary of Paradoxes, chiefly on the magnetic or attractive power of wounds; and this fanaticiſm, which laſted for no ſhort time, is not perhaps to be paralleled in thoſe ages when all Europe was abſorbed in the ſtudy of the perpetual elixir, the univerſal ſolvent, and the tranſmutation of baſe metals into gold. This fanaticiſm relates to your profeſſion, and therefore I will give you a hiſtory of it in few words:—

Sir Kenelm Digby, ſecretary to Charles the Firſt, was driven into exile during the civil wars; and in that period of his life we find him at Montpelier pronouncing among the doctors there a public oration, in which he congratulates the world upon the diſcovery of this ſympathetic powder, which he had firſt learnt from a Carmelite, who had travelled over Perſia, India, and China. Soon after this oration, Digby returned home; and in no country was there a fairer opportunity of exhibition than in England, where even the Court was infected with this mental diſeaſe; the King himſelf writing on Demonology; courts of juſtice condemning witches to the ſtake, and a nobility running from one end of the kingdom to the other to have their horoſcopes read to them.

" One morning," ſays Digby, " came to me Mr. James Howell ſecretary to the Duke of Buckingham, who, ruſhing in between two friends in a rencounter, had been grievouſly wounded in the palm of the hand, through the tendons, nerves, and muſcles. I deſired to have the cloth, or any thing which was but ſtained with his blood. A bloody garter was brought to me. I diſſolved a handful of vitriol, and threw into it the garter juſt as it was brought, when preſently the Secretary, who was talking with ſome noblemen in a corner of the

unto I dedicate it, ſo act thou for the glory of God. He proteſts that his chief motive for the dedication is to " avow the feud or free farm of his eſſence to God; and he ſeems to be very ſorrowful and melancholy at not being able to get a tranſlation of the Hallelujah, which the angels are continually ſinging, for it would make a very fine part of the dedication. Van Helmont not only delivered the learned ſympathetic experiments of his maſter Paracelſus, but added many of his own; and eſpecially you will find in p. 704, how he held the fore-paw of a lady's lap dog in his hand with a certain herb, by which the lap dog was ſo perſuaded, that it forſook the lady its miſtreſs, and ſtood and howled for love of VanHelmont all night at his chamber door.

There you will find alſo love powders and potions, and their effects; and how a certain gentleman having borrowed a noſe from the backſide of a ſilk weaver in Bologna, the ſurreptitious noſe one day looked very blue, and next day dropped off; and when he ſent expreſs to Bologna to know what was the matter, he found that the weaver had fallen ſick and died on the very day on which the noſe became blue, and that the backſide could not well have been cold before the " ſympathetic ſnout dropped off."

chamber, and quite ignorant of what was doing, found himſelf ſuddenly relieved from all pain, and felt very ſtrangely at the ſame time, as if all at once a cold breath had blown upon his hand, or as if a moiſt cloth had been laid over the back of it. While the Secretary took care of the hand to keep it clean, and in good condition, I (ſays Digby) kept the BASIN carefully in the ſun by day, and in a warm corner of a ſtove by night; ſo that the garter never wanted that degree of heat which is natural and kindly to the living body *. This affair of the Secretary came to the ear of the Duke, and through him to the King, who became very deſirous of knowing the truth of ſuch an affair; and Digby, the more to incite the King and the Duke, went immediately after dinner, and took out the garter from the baſin, and began to roaſt it before a briſk fire. But before it was half dry, a ſervant maid came running breathleſs to tell him, that her maſter had been juſt then ſeized with a more dreadful pain than he had ever had, and with a ſenſe of burning, as if live coals had been laid upon his hand. Digby told her, that he ſuſpected, nay he abſolutely knew the reaſon, and that he ſhould take care that her maſter ſhould be immediately relieved; ſo having plumped the garter into the baſin again! before the girl got round to the next houſe where her maſter lived he was quite relieved from pain, and was ſoon cured.

If theſe philoſophical phyſicians had not been all very ſerious about this ſympathetic cure of wounds, one ſhould naturally have ſuſpected the learned letter of the Clariſſimus Dom. Strauſs, to be a piece of finiſhed irony. "That very cure," ſays he in his letter to Digby, "which you performed upon the Secretary Howell, was performed by an Engliſh nobleman, L. Nicholas Gilbourne, upon a carpenter; but he performed it in the dry way. This nobleman, Gilbourne, always kept a box of the ſympathetic ointment by him. He heard that a certain carpenter had cut himſelf very deep with his axe. He ſent for the axe, which was all beſpattered with blood, and ſmearing the edge of the axe with his ointment, he wrapped it up warmly and carefully with linen, and hanging it up upon a nail in his cloſet, locked the door and left it there †. From this time the carpenter found himſelf perfectly relieved, and mended daily to his

* Ita ut ſanguis pericellide adherens, nunquam non in loco naturali, corporis ſani temperamento conveniente, aſſeveratur. So that the garter was all the while at the bottom of the baſin minding its buſineſs, while the Secretary was going about his own concerns.

† Unguento ſuo ſecuris aciem cruentam perfricans eamque pannis linteis a frigore muniens.

heart's content. But one day he complained very greatly of his wound, and of the heat and pain in it; and his friends wondering what it could ariſe from, ſince they ſaw no outward cauſe for this ſudden pain, ran to the Lord Gilbourne, who ſtepped into his ſtudy with all poſſible haſte, and found, to his utter confuſion, that the axe by ſome unlucky accident had fallen down from the nail; it was lying upon the ground uncovered, all the kindly cloths which he had wrapped about it fallen off, and the anointed part quite expoſed *.

Theſe were the cures known by the name of Sympathetic, becauſe performed at a diſtance, and by the medium of a bloody towel, or by practiſing upon the bloody ſtain which was left upon the ſword or knife. In want of the guilty knife, they drew any other knife or ſword acroſs the wound, and ſtained it with blood, and operated upon it. The medicines which they uſed they called ſympathetic powders, ſympathetic ſolutions, or the unguentum armarium, becauſe the ointment was applied to the weapon †.

I ſhall not detain you with their manner of preparing their vitriol for three hundred and ſixty-five hours under the ſun, while the ſun paſſed through certain ſigns of the zodiac; nor with their manner of compounding their ointments, which were made of materials more heterogeneous and horrid than thoſe which the witches drop into the cauldron; human fat! human blood! mummy, the moſs that grows in dead men's ſculls, a hog's brains, &c. You have a perfect conception of the Gothic ignorance and wild fanaticiſm of the times, when I tell you,

* Ad ſuum conclavum, feſtino gradu properat; invenitque ſecurim, forte fortunâ humo proſtratum, linteis amiculis deſtitutum atque partem unctam aeris inclementiæ obnoxiam. There is no want of authorities for cures of this kind. Mohyus cured the celebrated Italian Captain Doria of a cruel fiſtula in his ham by ſympathy. All wounds were cured by bloody napkins, and all ulcers by napkins moiſtened in the pus or ſerum. Octavius Guaſeus cured all his wounded ſoldiers in this way, which muſt have been a vaſtly convenient thing for a General; eſpecially as this ſympathy is an influence which ſome of the ſympathetic doctors affirmed might cure a man though he were in the moon, juſt as eaſily as the moon cauſes tides in the ſea; and all of them were ready to affirm, that the ſympathy extended thouſands of miles. "Aſperſo pulvere vel loco vicino, vel quantum vis remoto patiente, ſeu ſine ullo loci termino. Multo magis eſſe ſphera aliorum agentium ſublunatorum ab 1000 milliaria propagari haud temere affero." The celebrated Papin, who invented the Digeſter, after enumerating many cures, takes a witneſs very ſuitable to the occaſion. Teſtem voco occulatiſſime Caſſanie, qui ejuſmodi ſtupenda toties obſervaſti. Is not this an admirable invocation and moſt apt epithet. Occulatiſſimus Caſſaneus?

† "If it be a punctured wound merely, take your unguentum armarium and draw it along the ſword from the point towards the hilt; if it be a deep cut, lay on the ointment by ſtroaking from the ſide towards the back of the weapon; if you be not ſure how deep the wound is, anoint the ſword or knife all over."

that among the great maſters of the ſympathetic ſchool, one of the chief ſchiſms aroſe from this queſtion, "Whether it was neceſſary that the moſs ſhould grow abſolutely in the ſcull of a thief who had hung on the gallows, and whether the ointment, while compounding, was to be ſtirred with a murderer's knife?" Such was the ignorance of that age, that thoſe who oppoſed theſe ſympathetic cures never queſtioned the fact. Even Hildanus acknowledges, that the ſympathetic phyſicians treated wounds, or rather the knives which made the wounds, "quotidie, et quidem ut par eſt, diligenter; cito, et ut videbatur, ſatis feliciter et fere abſque dolere." This is not ironically, but very ſeriouſly ſaid. "Yet often," ſays Hildanus, "this method produces inflammation, makes the wound run with foul ſanies; and, worſe than all, it ruins both ſoul and body; it leaves a black indelible ſtain in the conſcience of him who uſes it; for it is an invention of the very devil himſelf *."

Even in Proteſtant countries, ſuch as Hildanus and Digby lived in, it was not altogether ſafe to incur the reproach of performing incantations. We may be ſure there was ſome danger, from the violence with which the enemies of the ſympathetic cures exclaimed. O hominis inaudita impietas O ſæva inhumanitas! The profeſſors, therefore, of the ſympathetic cures began to proteſt that they uſed no incantations; and they defended their cures on philoſophical principles, by the analogy of other natural operations. The celebrated Des Cartes, Kircher, Gilbertus, Papin, Charleton, and a hundred others, produced philoſophical proofs, very ſuitable to the groteſque taſte of thoſe times †. But, like other jugglers, they did not neglect the means of eſcape. Digby, who was the maſter ſpirit of them all, firſt ſhowed by how many philoſophical analogies the ſympathetic cure was ſupported, and then proceeded to remark, that the vital ſpirit of the blood ſinks into the ſtuff of the linen, or into the metallic pores of

* "Non ſolum graviſſima ſymptomata excitat, optimamque valitudinem, corporis diſtruit, conſcientiæ quinetiam maculam inurit. Inventorem hujus unguenti eſſe Biabolum teſtantur viri doctiſſimi." Hild. p. 851. In officino vero Diaboli, unguentum hoc peſtiferum nocumentum non medicamentum, &c. Experientiam non negamus nequaquam vi naturæ ſed Cacodemonis conſilio, &c. Deuſingius, p. 41. Papin paſſim.

† Their arguments were generally ſuch as follow: That any lute being tuned in uniſon with another, is affected when the other is ſtruck; the magnet turns by ſympathy to the pole; amber attracts light bodies; the lapis ætites hung round any part of a woman in labour, attracts the fœtus, delays the labour when hung round the neck, and quickens it when hung round the thigh, and when laid on the pit of the ſtomach, comforts the child. Loadſtones hung to the breaſt make us cheerful and merry, and the WEARING of JEWELS ſecures CHASTITY!!! Adamantim cordi lætitiam conciliare, Saphirum Smaragdam, Uniones caſtitatem; non eſt contra rationem. If it be not againſt reaſon, it is, however, a little againſt experience,

the ſword; for this ſubtile ſpirit penetrates the pores and reſides among them; but if this ſpirit, ſays Digby, be evaporated by time, or drowned by moiſture, or waſhed out of the linen, eſpecially by hot water, vinegar, or ſoap (for cold water ſignifies leſs), or if it be burnt out of the ſword by heating it, then all is over, for the ſpirit being gone, what good can the vitriol do upon the ſword or linen? To be aſſured of this, you have but to expoſe the ſword-blade to heat. "You will ſee," ſays Digby, "the very ſpirit itſelf ſweating out upon the oppoſite ſide like breath upon a looking-glaſs."

We can repreſent to ourſelves one of thoſe juggling philoſophers, poring with glaſſes over the knife or ſword, learning from the bearer of it, all the circumſtances of the wound; firſt, diſcovering whether the wound be ſuch as will prove too hard for the ſympathetic cure, and then telling the bearer with a grave face, that he perceives that all the finer ſpirits are eſcaped!

At firſt we are ſurpriſed with the univerſal approbation which theſe follies met with from all the great men of thoſe times. They all acknowledge that ſympathetic cures were ſucceſsful. They refuſed to practiſe theſe cures, only becauſe they were impious and unlawful; for even Hildanus and Purmannus ſay, "though many have written againſt this, how can we contradict matters of fact." The matter of fact is eaſily explained. Theſe ſympathetic phyſicians underſtood the cure of wounds by adheſion, more perfectly than the other phyſicians of their time. The world needed to be cheated into this ſafe and eaſy method of cure. They uſed their ſympathetic cure (which was plainly a way of procuring adheſion) in no caſes which might bring diſgrace upon their art; they refuſed to uſe it in wounds where they could foreſee ſuppuration; they declined it "where much digeſtion was required, or where the larger blood veſſels were wounded." They abſolutely refuſed to perform their ſympathetics in caſes of gunſhot wounds *. They took care to pledge themſelves only for thoſe wounds which they were ſure might be made to adhere. Purmannus himſelf ſaw a quack in the city of

that diamonds and pearls ſhould ſecure chaſtity. Papin ſaw a magnet hung about a fig-tree which ripened the fruit before his eyes, and when the magnet was laid at the root of the tree, down came the figs in ſhowers. In leſs than ten hours the whole tree was unloaded; but only he forgets to mention whether the experiment will ſucceed in calm weather. Huic enim (ficui, viz.) ſubmiſſo lapide, omnes ſponte groſſuli minus horis decem deorſim ceciderunt.

* Senertus in his Liber Practica, 5 p. 4. c. 10, obſerves, eſpecially in ſpeaking of the unguentum armarium, that even among thoſe who had praiſed it the moſt, no one ever ventured to uſe it in GUNSHOT WOUNDS, though he himſelf could produce ſome very ſingular inconteſtible proofs of its ſucceſs.

Glogow mount the ſtage, and in preſence of the people, make thirteen gaſhes in the fleſhy part of his own arm, and roll it up very tight, cloſing firſt the wounds with ſlips of linen dipped in ſome warm mixture. According to his promiſe, he produced it next day to the people as good as healed. " This proves, ſays Purmannus, that this man knew how to cure wounds in a day's time, without the tedious method of bringing them to ſuppuration; a young ſurgeon who lived in my houſe, bought this ſecret from him for ſix rix dollars; it was merely a plaſter made of gum and mucilage; ſo that this may be truly called gluing wounds together *.

In thoſe days then, the curing of a wound by adheſion, was a thing which gave reputation even to a mountebank, and ſeemed indeed miraculous. But the ſympathetic doctors knew the ſecret, and how to make their own uſe of it. They choſe out fit caſes of clean inciſed wounds, they put the lips neatly together, and very generally held them cloſe by a ſticking plaſter, ſo well compoſed and ſo firm, that they called it the Emplaſtrum Strictivum †, they took care never to undo the dreſſing till the wound was healed. Had they openly profeſſed to heal a wound of the ſcalp without exfoliating the bone, or a wound of the fleſh, without a due purging off of the foul humours; had they propoſed to lay the lips of a wound ſimply together and make them adhere, they would have been greatly abuſed for following the ſimple rules of nature. But they contrived to get credit for ſomething like witchcraft, and they condeſcended to dreſs the axes and ſwords that the wounds themſelves might have leave to lie at reſt till they healed. I will add to theſe, a ſhort hiſtory of one of our own phyſicians, above the rank, but not above the practices of a quack. It will prove how very ſlowly the beſt methods were received, and how perfectly this practice of procuring immediate adheſion had ſucceeded, even in the moſt dangerous wounds and in the rudeſt hands.

The perſon I mean was named Dr. Colbatch, whoſe hiſtory, according to my underſtanding of it, is exactly that of a reſpectable quack. Dr. Colbatch began his career by proclaiming to the world, " That he had, after ſeven years

* When carpenters wound themſelves with their tools, they take a thin wood ſhaving, and ſpreading it with hot glue, they glue together the lips of the wound; the ſhaving ſticks faſt till the wound adheres and ſoon falls off of its own accord.

† Theſe very powerful adheſive plaſters were very generally compoſed of gums, wax, ſtrong glue, and ſometimes white of eggs, and the compoſition, ſomething betwixt a paſte and a plaſter, was made ſo firm that nothing could diſplace it till the wound adhered.

ſpent in experiments and ſtudy, lighted upon a pair of medicines which were infallible in the cure of wounds; the one an internal medicine, the other external." Finding that theſe would anſwer, he began to make his experiments upon dogs, by wounding them in the moſt deſperate ways. Of one hundred experiments, five only failed, three of theſe were made before my Lord Cutts. "Two of theſe dogs," ſays Colbatch, "as I can plainly make it appear, were poiſoned after the chief danger of the experiment was over. His enemies among the camp ſurgeons were ſo wicked as to poiſon even his patients like dogs. I was much abuſed, ſays Colbatch, in the caſe of a ſoldier of Lord Cutts's regiment; for after my medicines had relieved him of almoſt all ill ſymptoms, and I had been myſelf conſtantly with him during four or five nights for fear of miſchief, he was, in my abſence, made drunk, and died an hour or two after my return." At his own coſt, Dr. Colbatch had bought and prepared a great quantity of his pair of medicines, and went over at his own charges to Flanders, where it appears that the King had taken very particular notice of him, ordering by public proclamation in the camp, that the wounded ſhould be brought to him. It is to be noticed, that in all the methods of ſecret dreſſing, there has been a ſtrange mixture of quackery and incantation; and whether the cure was performed by ſympathetic powers, or unguentum armarium, or by ſucking; the reports of its ſucceſs were always very extravagant; the reports and caſes of Dr. Colbatch are by no means over modeſt. His caſes are very extravagant in the manner and circumſtances, but in all the eſſentials, I believe, they are very true. We are to judge from his general principles, not from his particular facts; or, in other words, we muſt make large allowance for the manners of thoſe times. We dare not, for example, truſt entirely to his reports concerning the army ſurgeons, for it was his buſineſs to find out reproaches againſt them; but there are many things which ſhow him to have been a man of obſervation, one who underſtood the radical errors of their practice. I obſerve, ſays he, firſt, "That in all wounds of any conſequence, though merely fleſh wounds, &c. they confine their patients to the loweſt diet imaginable, forbidding them fleſh and wine, and that although they have ſuffered great loſs of blood." Secondly, he ſays, "I will not mention the tenting, probing, and other trumpery and nonſenſe which are uſed by moſt ſurgeons to the great detriment of their patients." His method, ſo far as he allows himſelf to diſcloſe it, is manifeſtly one which muſt have been of infinite importance in

an army, where all the ſurgeons tortured their patients MORE CANONICO, and where he alone cured wounds by adheſion. He explains himſelf thus: "Suppoſe a wound to be made with a ſword, or other cutting inſtrument, the length or depth of which ſignifies nothing, I diſſolve ſome quantity of my powder in water; I waſh and ſqueeze the wound, and inject a little of this ſaid water into it; I then cloſe its edges together, and, if wide and large, I STITCH IT UP. In all caſes where my medicines have been applied in good time, eſpecially in all inciſed wounds, the wounds are perfectly cured in a FEW DAYS WITHOUT BEING BROUGHT TO SUPPURATION, and I have frequently obſerved, that at about four days end, ſuch wounds have been filled with a ſubſtance like unto hartſhorn gelly, which I have conjectured to be the new fleſh." When we ſee the man proceeding on ſuch certain principles, we are ſure that he muſt have been of infinite uſe; and being the only man in the camp who knew how to cure a wound by adheſion, his cures muſt have been very ſurpriſing, and his patients particularly eaſy, while thoſe of others were enduring great pain. To be aſſured of this, we need only know his principle, and we muſt not undervalue his ſkill on account of the lying exaggerations with which he thinks fit to ſet it off. I am perſuaded that he often cured, without any bad ſymptom, men who were thruſt through the breaſt or belly, and yet I am amuſed with his manner of telling it. In wounds of the breaſt he never fails to ſettle the point of the lungs being actually wounded, by telling us how great the blaſt of air was. In moſt of his caſes "the blaſt is almoſt equal to that of an ordinary pair of bellows." In one caſe it blew a perfect hurricane; for Mr. Cholmondely, his aſſiſtant, declared that he could ſcarcely with his hand keep on a dreſſing, ſo that in order to bring the lips of the wound together, he took a needle and thread and ſewed up the wound, but the force of the air was ſo great, that he was forced to make his ſtitches in the external part of the bone (i. e. of the rib) which is griſtly, by reaſon that the ſkin was not ſtrong enough to hold them."

Another of thoſe who followed our armies two centuries ago, is that famous phyſician and knight, Fiorovant. He proteſts much againſt the irregular method of digeſting, and incarning of wounds, the ſtuffing them, teaſing them with all kinds of waſhes and ointments, and parching them with turpentines and hot oils. "Dreſs your wounds," ſays Fiorovant, "in whatever parts of the body, without any tenting at all; for the third order of cure is of our own invention, that is, whereſoever a man hath a wound, either ſimple or compound, the firſt thing that is to be done therein, is to join the parts cloſe together, and

to ſtitch them and dreſs them with various ſorts of drying medicines." As to ſimple wounds, where no ſinew, bone or vein is injured, join the wound together quickly, and ſtitch it cloſe, AS THEY USE TO SEW BAGS, and not with great wide ſtitches. To heal wounds according to the manner of the ancients, it were great trouble to the chirurgeon, and pity to ſee the pain of the patient. Now, ſince this Fiorovant was at ſuch pains in putting the lips of the wound together, we need not wonder that his balſam, BALSAMUM FIOROVANTI, had come into ſuch repute, nor need we trouble ourſelves to inquire what it was. Still this moſt excellent practice of procuring adheſion, was avowed by no one; and while the regular ſurgical method of ſuppurating and digeſting, and incarning and cicatrizing of wounds, was alone acknowledged by men of learning, this better practice of procuring adheſion, continued almoſt excluſively in the hands of quacks.

Though all theſe cures by adheſion were very myſteriouſly performed, yet one in particular was called the SECRET DRESSING, in which great pains were taken, before laying the lips of the wound together, to ſuck out all the blood. The cure of wounds by SUCKING, was called the ſecret dreſſing; it was chiefly uſed in the army; the drummers of the regiment were the ſuckers; and the common ſoldiers ſubmitted to this cure ſecretly, in order to conceal their quarrels from their officers and from the prieſts. The practice of duelling had proceeded to ſuch lengths in France, that even the common ſoldiers ſettled their drunken quarrels with the ſword. A haſty word betwixt ſoldiers of two regiments in garriſon, eſtabliſhed a perpetual quarrel betwixt the corps. They went out in the evening to the ſkirts of ſome adjoining wood, and fought by ſcores; when they happened to quarrel in taverns, they fixed their pocket-knives upon the brooms and mop-ſticks; and when their knives and ſide-arms were taken from them, they fought with ſticks ſharpened and hardened in the fire, which we find made more deſperate wounds than tempered ſwords; wounds, bruiſed, livid, and ſloughing, like thoſe made by ſhot. When a party went out to the wood, the drummer of the regiment, or ſome good experienced ſucker, went along with them. The duel ended the moment that one of the combatants received a wound; the ſucker immediately applied himſelf to ſuck the wound, and continued ſucking and diſcharging the blood, till the wound ceaſed to bleed, and then, the wound being clean, he applied a piece of chewed paper upon the mouth of it, tied up the limb with a tight bandage, and the patient walked home. The ſcavoir-faire, or trick and cunning of this way of cure, conſiſted in making

grimaces and contortions, ſigning their patient with the ſign of the croſs, and muttering between their teeth ſome unintelligible jargon. All their care was to keep their profeſſion among themſelves; and it was from this profanation of the name of Chriſt, and this abuſe of the ſign of his croſs, that there aroſe a hot war betwixt the prieſts and the ſuckers, the prieſts refuſing confeſſion, extreme unction, or any ſacrament of the church, to thoſe who had undergone theſe magical or diabolical ceremonies;—while the ſuckers, on the other hand, refuſed to ſuck thoſe who had any connection with the prieſts. The former were afraid of loſing the dues of the church, and the privilege of giving extreme unction and diſmiſſing the ſoul to heaven (for thoſe who ſubmitted to the ſecret dreſſing were uſually paſt all relief before the ſecret was diſcloſed to the prieſts): the latter, on their parts, were careful to preſerve a trade which was not without its emoluments. Verduc obſerves, "Suxerunt quidem at non ſanguinem ſed potius aurum." They were ſtill more ſkilful in ſucking gold than blood *.

In fleſh wounds they could not fail of perfect ſucceſs. The ſucking out the blood, the cleaning the wound, the laying on of compreſſes, and the cloſe and nice bandages which they applied, prevented the further effuſion of blood (which always acts as a foreign body, and prevents adheſion), and ſecured to them a very ſpeedy cure. No wonder, then, that this became a univerſal practice, and that men of high rank carried ſuckers with them when they went to fight duels. The ſucceſs of the ſecret dreſſing was acknowledged by the moſt eminent ſurgeons. "I could well believe, ſays La Motte, ſpeaking of the ſuckers, that they often healed fleſh wounds, of the arm, for example; but that they ſhould heal wounds acroſs the cavities of the breaſt and belly in a few days, and altogether conceal the wound, ſeemed quite incredible." Yet this was true, and this fact may be a comfortable aſſurance to us, that even among

* This buſineſs of ſucking had been the baſeſt trade of all. "Two gentlemen having gone out in an affair of honour, one of them was wounded through the breaſt, about a finger's breadth beneath the right nipple. There was a wound of the intercoſtal artery, with great oppreſſion of breathing; there was alſo a ſpitting of blood, which ſignified that the lungs were not unhurt. He was carried into his inn in a ſtate of delirium, where every thing that was neceſſary was done for him. But before he was dreſſed, there was a great clamour among the crowd about ſome who could ſuck out the blood that was in the cheſt. Upon being brought in to ſuck the wound, one of the rogues, while ſucking, ſtole a diamond ring from the gentleman's finger worth a thouſand florins, and was taken in the fact." Unus enim inter ſugendum, vulnerato annullum adamantinum, mille florentis comparatum clam detraxit ſed proditus iterum reſtituit.

the viſcera we may procure adheſion of the various wounded parts. For La Motte himſelf was incredulous; he had the faithful teſtimony of thoſe ſecret combatants; he had often ſeen the ſcars, both on the back and on the breaſt, of wounds which muſt have paſſed quite through the bowels and lungs! but ſtill he would not believe, until at laſt he had the good fortune to ſee this magical piece of ſurgery performed with perfect ſucceſs.

"One day he was called to a young fellow, a common ſoldier, who had been run through the breaſt with a fair lounge, in at the pap and out at the ſhoulder. After having examined the wound, and noticed, ſays La Motte, the length of his antagoniſt's ſword, being well ſatisfied that the weapon had pierced the lungs, and gone quite acroſs the breaſt, I ſaw the drummer of the regiment (who was the ſucker on this occaſion), do his buſineſs. He firſt ſucked one wound; then, turning his patient over, he ſucked next the oppoſite wound; he then applied a piece of chewed paper upon each, and next day the ſoldier was ſeen walking in the ſtreets." After this La Motte ſaw a man of better condition ſucked with the ſame ſucceſs. He was the brigadier of a horſe regiment, who had been wounded quite acroſs the lungs, but without any material harm to the lungs, or great veſſels. Thus, ſays La Motte, is this way of ſucking wonderfully ſucceſsful; and with great ingeniouſneſs, he adds, "Indeed, it appears to me, that if theſe ſuckers applied their cure with ordinary diſcretion, ſucking no wounds but ſuch as could be cured by adheſion, their method would be more ſucceſsful than any that we ſurgeons uſe *."

In duels with the ſword, the wound is often in the thorax, and uſually through the lungs; it is never a ſimple wound, and yet it will often heal; ſometimes ſome great artery is wounded; the intercoſtal artery, perhaps, is touched, and pours out blood, the cheſt is filled with the blood, and the patient falls into oppreſſions and anxieties. Even in this complicated caſe, the ſuckers ſometimes ſucceeded ſo far as to heal the outward wound; but the patient being oppreſſed by the inward bleeding, was, in a few days, in danger of ſuffocation, and often became unable to ſpeak, had fallen into deadly faints, and was receiving the laſt ſacrament of extreme unction before a regular ſurgeon was called to lay open the wound, and diſcharge the blood. Dionis had been troubled in his time with the ſuckers; and in a quarrel which happened in one of the courts of the palace of Verſailles, two gentlemen of high rank

* La Motte, p. 22.

were both at once wounded in the breaſt; one was ſucked by the drummer of his own regiment, the other was committed to the care of Dionis; and next morning it was wickedly reported to the King, that the gentleman committed to the care of Dionis was dead, while he who was ſucked, was out of danger. This might have happened, and might have done harm a thouſand ways! but ſo it chanced, that the truth was directly the contrary to this firſt report; for, in the evening, this latter gentleman was ſeized with ſuch oppreſſion, that he had taken the laſt ſacrament before Dionis could be brought to him. When he came, he performed the operation for empyema, opened the cheſt, let out the extravaſated blood which oppreſſed him, ſo as to relieve him inſtantly, and cure him in a very ſhort while. Both the patients were thus ſaved by Dionis.

It ſeems as if from the firſt a ſort of fatality had hung over the doctrine of adheſion, which was, however, in the end, deſtined to improve ſurgery more than any other; for the practice of procuring adheſion had been a profeſſion only among quacks; nor did they even dare to declare an intention of immediately reuniting wounds in direct oppoſition to the canons of ſurgery. This practice had never been received by men of learning, nor riſen into the importance of a doctrine; but it was about to do ſo, when moſt unhappily for our profeſſion, Talicotius publiſhed it as an invention of his own! but in a form ſo fantaſtic, and connected with ſuch idle and trivial objects, that it became with all the learned, as well as among medical men, a matter of amuſement; and the world was juſtified in their contempt and ridicule of it by the opinions of the greateſt men in our ſcience. "Neither art nor nature, ſays Veſallius, is endowed with ſuch powers as to reſtore a noſe which has been cut off; to attempt ſuch a cure is little better than if an ape ſhould begin to philoſophize, and ſay, I will go and learn to fly *." This was unfortunately the light in which all ſenſible men conſidered a doctrine which, had it been received a hundred years ago, as it is at this day, would have ſaved the lives of thouſands. But moſt unhappily, after the days of witchcraft, and ſympathetic cures, were over, there roſe up ſeveral doctrines too ſimilar to them to be well received; the extravagance of the diſcoverers took away all hopes of profiting by their inventions; ſurgeons turned

* "Atque proinde ejuſmodi curationem tentare idem eſt ac ſi ſimia philoſopharetur velletque per aerem volare." Veſallius, 983. Is it not very extraordinary that this very author Veſallius ſhould be quoted by Portal, in his Hiſtory of Surgery and Anatomy, as a ſtrong ſupporter of Talicotius's doctrines?

with contempt from the firſt dawnings of rational theory and ſound practice; to their old canon of digeſting, incarning, and cicatrizing wounds.

There is no queſtion that the humours of the eye may be evacuated, and reſtored again; that the blood may be transfuſed from body to body, not only with ſafety but with advantage, eſpecially in hæmorrhagy; and that parts ſeparated will reunite; as an extracted tooth! which will, if put back preſently into its ſocket, reunite with it, and continue a living part of the living body. If a tooth pulled out of the head, laid in a baſin, waſhed in tepid water, and then put again into its own ſocket, or transferred to another perſon's jaw, can reunite; there need be no queſtion that an inciſion being made in a man's arm, and his noſtril pared! the flap of ſkin in the arm may be united to the noſe; yet theſe facts, ſo nearly allied to the miraculous, in order to be well received, ſhould have been propoſed in a very modeſt way. But it was not ſo with theſe diſcoveries; Burhius and Kerkringius pretended to be poſſeſſed of particular medicines, by which they could reſtore the eye after it had been burſt or cut open; Taylor, Woolhouſe, and others, pretended to cure the blindneſs of old age, by extracting the muddy humours of the eye, and replacing them with freſh tranſparent humours, by which the ſight became as clear and fine as in the youngeſt perſon *. Many pretended to reſtore to the aged health and ſtrength, by withdrawing from

* Kerkringius tells his ſtory in the following lamentable terms: That the King of Denmark, who was as ſkilful in ſciences, as clear in governing his realms, one day when he was reading a curious book upon glaſs-making, written by Andreas Friſius, aſked his phyſician, Burhius, who was ſtanding by, whether this ſtory that the author told in his preface could be true, about cutting the eye open, and letting out the humours, and reſtoring it again? "O!" ſays Burhius, "that Theodorus Kerkringius, mentioned there ſo honourably, is one of the pooreſt of my ſcholars in this art." Kerkringius in revenge tells the whole ſtory; how he had heard of Burhius being poſſeſſed of this art; how he had wiſhed to aſk the ſecret; and how he was aſhamed to propoſe buying it from a gentleman like Burhius; how he ſtudied and laboured to find it out; and how he ſucceeded without any obligation to this fame Burhius. "Hoc ſcio, et hic profiteor me nullo horum modorum oculos reſtituere; reſtituere tamen alia prorſus ratione, aliiſque a me ſolo inventis viis addo; nec facere me diſtinctionem inter albos et nigros, ſed quolibet oblato animali, &c." "It matters nothing to me whether the eyes be black, brown, or grey, bring me what animal you pleaſe, I will cut his eyes open, ſqueeze out all the humours, give him back to you as blind as a mole, and yet reſtore his eyeſight in a very little while: I have done it often for fun (experientiæ cauſa), and have done it three times on the ſame dog." Now, this is what Burhius could not do according to Kerkringius, for Kerkringius tells how he was admitted to one of Burhius's exhibitions, which failed, "and the dog goes to this day in the ſtreets of Amſterdam blind of that eye." "Qui canis adhuc hic Amſtelodami vivit quidem ſed non vidit illo qui diſciſſus fuit oculo."

their ſyſtem the effete blood, and filling them up with healthy and youthful blood. Purmannus "drew off the blood of a merchant's ſon at Berlin, who had the leproſy, and infuſed into him the blood of a YOUNG LAMB, and cured him, to the admiration of many perſons *. So much did the rage for theſe experiments prevail, of transfuſing blood, and injecting liquors into the veins, that Purmannus, after mentioning his having cured the falling ſickneſs in ſeveral, by injecting medicines through the veins, concludes with ſaying, "It was alſo twice tried upon myſelf; firſt, when I was grievouſly afflicted with a ſort of leproſy, but then it was not artificially performed. And again, a ſecond time at Anſlam, when I was ſick of a violent fever, and ordered aqua cardui benedicti to be injected, upon which I was wholly delivered from my fever in leſs than two days time."

Talicotius, a citizen of Bologna, was a man of great learning and ſkill; he lectured on anatomy and ſurgery in that city, and was buried in the church of St. John's, where the Faculty of Medicine erected a ſtatue in honour of him †.

Talicotius begins with obſerving how trees receive a graft, and unite with it ſo entirely, as to tranſmit a new flavour to the fruit. He recapitulates all the arts of ingrafting; and upon the analogy of theſe rules and practices, he founds his theory of uniting the parts of the human body. He propoſes to reſtore ears, noſes, and lips that have been cut off; he pares the defective noſtril, ſo as to make it raw, like the edge of a hare-lip; he cuts deep into the arm, and turns back a flap of the ſkin, but leaves the piece of ſkin ſtill attached to the arm, ſo that it continues in full circulation; he pins it, or ſews it to the WING of the noſe; ties the head to the arm by one bandage, ſo that it cannot move; and ſupports the head upon the neck by another bandage, ſo as to leſſen the fatigue of the poſture, and after ten or twelve days undoes the bandages, and cuts the flap away from the arm. If another noſtril is wanting, he now makes the adventitious piece of ſkin raw, and joins it to the ſecond noſtril; and when all this is done, he carves out noſtrils, and ſhapes the whole into the right form of a noſe. He affirms, that he had done this often; and that not unfrequently the hair grew

* Purmannus, p. 304.

† D. O. M.

Gaſpari Talicotio civi Bononienſi philoſopho ac medico ætatis noſtræ celeberrimo. Cum univerſam humani corporis anatomen doctiſſimorum virorum frequentiſſimo conventu publice adminiſtratam facundia methodo ac doctrina admirabile explicavit, ejuſque incompertas adhuc partes in lucem prodidit, animi grati et perpetuæ.

upon ſuch noſes, ſo that they needed to be ſhaved. That all this is poſſible, I do moſt certainly believe it actually was performed often; and at this day in India, where cutting off lips and noſes is a common piece of revenge, and even a common puniſhment, an operation equally difficult is performed, when a piece of ſkin is cut up from the forehead, and turned down, to ſupply the place of the noſe. Hildanus is one of unimpeached authority, who ſaw this operation of Talicotius performed. Fienus is another, whoſe book is that of a ſcholar and a gentleman, who aſſures us of the truth of his ſucceſs; and he alſo remarks, that his ſtatue was erected by the Univerſity of Bologna, after having witneſſed many facts of this kind *.

As there is nothing unnatural in this operation, as this reunion of divided parts is juſt ſuch as we procure in more difficult circumſtances every day, the doctrine, and all the uſeful concluſions which would have flowed from it, would not have fallen into ſuch diſcredit, had it not been for the ignorance of ſome, who thought to lie the theory into credit, and who undertook to back up this reaſonable doctrine of Talicotius with abſurd incredible ſtories! So much leſs dangerous is it to have a wiſe enemy than a fooliſh friend. The learned credulity of Van Swieten is not more particular than the vulgar credulity of Garengeot. This Garengeot had the boldneſs to ſtand out amongſt the foremoſt of the defenders of Talicotius, and riſked the following tale: "A young fellow, ſays he, a ſoldier, reeling out of a tavern drunk, along with ſome of his companions, got into a quarrel, in which, one of them bit his noſe off, threw it into the gutter, and trod it under foot. He picked up his noſe, flung it into Mr. Gallin's, an apothecary's ſhop, ran after the fellow who had done it, and when he returned, Mr. Gallin waſhed the noſe at the well, ſtuck it with plaſter in its place, and in two days after it was firmly united; and Mr. Garengeot, four days after, dreſſed the noſe with his own hands." But this tale, after all, is but a poor one, compared

* In the hall of the Medical Faculty at Padua is a ſtatue holding a noſe in the hand, with the reſpectful epitaph which I have juſt recited engraved upon the pedeſtal. This was erected by his contemporaries, and could not be meant as a ſarcaſm; or if ſo, it was a very ſerious and expenſive joke. J. B. Corteſius, Mollinetus, and alſo Reaumeur, in the French Academy of Sciences, declare the ſucceſſes of Talicotius; and Fienus, p. 168. ſays very directly in theſe terms: "Ego etiam teſtari poſſum Caſpar. Talicotium profeſſorem chirurgiæ in Acad. Bononienſi, plurimos hac arte naſos reſtituiſſe, quorum *EGO ALIQUOT RESTAURATOS IN ALIQUIBUS VIDI, ALIOS ACTU FABRICARI.*" "I have both ſeen finiſhed noſes of Talicotius's, and have alſo ſeen him actually buſied in making them."

with that told in the following terms by Sir Leonard Phiorovant, Knight: "Of the cure of one that had his noſe cut off, and ſet on again."

"In that time, when I was in Africa, there happened a ſtrange, and this was it. A certain gentleman, a Spaniard, that was called Seignior Andreas Guitiero, of the age of twenty-nine years, upon a time walked in a field with a ſoldier, and fell at words with him, and began to draw. The ſoldier ſeeing that, ſtruck him with the left hand, and cut off his noſe, and there it fell down in the ſand, and then I happened to ſtand by and took it up, and piſſed thereon to waſh away the ſand, and ſtitched it on again very cloſe, and dreſſed it with our balſamum artificiato, and bound it up, and ſo let it remain eight days, thinking that it would have come to matter: Nevertheleſs, when I did unbind it, I found it faſt conglutinated, and then I dreſſed it only once more, and he was perfectly whole, ſo that all Naples did marvel hereat, as is well known, for the ſaid Andrea doth live yet, and can teſtify the ſame *." The Talicotian doctrine of adheſion is unqueſtionably true, but not to this extent. I hold it poſſible to preſerve every flap of ſkin, though almoſt entirely inſulated! though left hanging by a tag merely! but thoſe parts which are entirely ſeparated are entirely and irrecoverably dead. I agree with Dionis "that theſe pretenſions are abſurd, but we may eaſily ſew up noſes, and lips, and cheeks, which are only in part cut away †;" and yet I know of ſome men of the firſt rank in their profeſſion who believe this tale of Garengeot's. One gentleman of very particular abilities carried me to ſee a man who had chopped off the point of his finger with a tobacco-knife; it dropped down upon the board before him; he took up the piece of his finger, clapped it in its place, fixed it with a roller, and there it ſticks to this day. I am, I confeſs, very ſceptical with regard, not to the veracity of my friend, but to the explanation of the fact; may not ſo ſmall a piece of the finger have rotted after it was bandaged, the remaining fleſh upon the point of

* Mr. De la Faye, one of the greateſt ſurgeons of France, was at the pains to try this experiment in various ways. He cut off parts of the fleſh and ſkin in dogs, and faſtened them on again as nicely as he could, but to no purpoſe; and ſays Mr. De la Faye, even while I was making theſe experiments, a certain perſon having cut himſelf betwixt the thumb and forefinger, I came in good time to find the piece of fleſh, about the bulk of a ſhilling, which had fallen on the ground diſregarded. I applied it as well as poſſible to ſee whether it would reunite; it fell off in ſcales, leaving ſuch a cicatrix as convinced me of the inutility of all ſuch attempts. La Faye's Principes de Chirurg. p. 370.

† Vide Dionis, p. 64. where he denies abſolutely and unconditionally Talicotius's art of making ears and noſes out of the fleſh of the arm.

the finger growing up to ſupply its place? But if this be really true, if we can fix on a finger, or a piece of a finger, which has been chopped off, then we have ſuch a ſuite of facts, that we may in future expect much more extraordinary cures! Mr. Gallin fixed on a noſe that had been troden under foot! Phiorovant piſſed on another noſe, and then ſtuck it on! and ſomebody, I know not who, put on a finger! and who knows but we may ſome day or other need to ſet on a leg or a head. That no perſon, in caſe of any ſudden accident, may plead ignorance, I ſhall here deſcribe the method from the celebrated Rabelais of ſetting on a head: "Having gone out to ſearch the field for Epiſthemon, they found him ſtark dead, with his head between his arms all bloody. But Panurge ſaid, my dear Bullies all, weep not one drop more, for he being yet all hot, I will make him as ſound as ever he was. In ſaying this, he took the head, and held it warm fore-againſt his cod-piece that the AIR MIGHT NOT ENTER INTO IT*, and other two carried the body. Leave off crying, quoth Panurge, and help me. Then cleanſed he the neck very thoroughly with white wine, afterwards he anointed it with I know not what ointment, and ſet it on very juſt, vein againſt vein, ſinew againſt ſinew, and ſpondyle againſt ſpondyle, that he might not be wry necked: This done, he gave it round about ſome fifteen or ſixteen ſtitches with the needle: Suddenly Epiſthemon began to breathe, then opened his eyes, yawned, ſneezed, and afterwards he let a great ———; now certainly, quoth Panurge, he is healed; and ſo he was finely, only that he was ſomewhat hoarſe for about three weeks together †.

It is only by a moderate and rational application of this doctrine that our ſcience is to be improved: this property in living parts, of inoſculating and uniting again, is indeed ſo perfect, that we may depend on it with abſolute confidence.

* This old doctrine, of "the air entering into it," is elegantly ſet forth in a new and intereſting point of view, by one of the greateſt diſcoverers of the preſent age.

† Rabelais's father was a phyſician, or rather an apothecary like Mr. Gallin: We muſt either ſuppoſe that like him he had ſome quarrelſome fellow come ſtaggering into the ſhop with his head under his arm, or that this is meant as a ſatire on all ſuch doctrines. I had added to theſe remarks, in a former edition of this diſcourſe, the following ſentence, which I am now happy to retract. "If we may believe a writer of good abilities, the beſt modern ſtories of adheſion as that of a tooth adhering to a cock's comb, are little better than Talicotian tales." Let it be obſerved, that in ſaying this I merely quoted the authority of a late writer; but when Mr. Aſtley Cooper carried me into his muſeum, among the firſt things I ſaw in a corner was a moſt furious looking cock's head and gills, with a human tooth fixed by adheſion in the centre of the comb. When I fixed my eye upon it, my friend obſerved me; Ah! ſays he, "he does ſtare you in the face?"

This doctrine, modeſtly applied, has improved the practice of ſurgery more than any other; for in wounds and operations there are but two great points to be attended to; firſt, the ſecuring the arteries, ſo that the patient may be in no danger from bleeding, and then the procuring a ſpeedy adheſion, by which the pain, ſuppuration, waſte of ſubſtance, and all the other bad conſequences of the wound, are prevented.

Upon this principle, we are able to perform things in the regular way of ſurgery, as ſurpriſing as thoſe which paſſed for miracles in the times when the ſympathetic cures were in vogue. In wounds we ſave much pain, prevent a large ſuppuration, and great waſte of parts, and limit the ſcar of the greateſt wounds often to a narrow and almoſt inviſible line; and in operations, in place of leaving a broad ſuppurating ſurface, we make our inciſions of ſuch a form, as to leave but a very narrow wound, whoſe lips touch each other, and unite together with a ſcar that is very little perceived, and very quickly formed. In extirpating a teſticle, in cutting out a cancerous breaſt, in diſſecting away the largeſt tumors, we contrive, by ſaving the ſkin, to cure in ten days a ſurface, which, if cut according to the forms of the old ſurgery, and cured according to the old rule of digeſting and incarning the wound, muſt have taken at leaſt ſix months.

I would impreſs upon your minds this rational and moderate approbation of the doctrine of adheſion. Thirty years ago ſurgeons had no ſettled ideas concerning it; it was juſt then riſing ſlowly into importance; they had no motive for ſaving the ſkin; or when they had ſaved it, they did not know how it ſhould be uſed, nor how much it might contribute to a ſpeedy cure. If they extirpated a tumor, they cut away along with it all the ſurrounding ſkin. If they performed the trepan, they performed in a moſt regular manner that preliminary operation which they choſe to call ſcalping, or in plain terms they cut away ſix or eight inches of that ſkin which ſhould have ſaved the fractured ſcull from exfoliation, and which ſhould have immediately covered and defended the brain. In amputating a limb, they cut by one ſtroke down to the bone; and even when they performed the flap amputation, they dreſſed their ſtump and flap as diſtinct ſores. An exfoliation of the bone in theſe older operations was a thing unavoidable; without the caſting off of the bone the wound could not heal, ſo that in trepan, amputation, and all great operations, where there was a naked bone, it was part of the ſurgeon's art and ſkill to procure exfoliation; and the filling up, and final healing of their conical ſtump, was ſo ſlow a proceſs, ſo imperfect, and ſo

many exfoliations of the bone, with other lets and hinderances intervened, that it is no wonder their imagination was much occupied about the digeſting, incarning, and cicatrizing of wounds. Wherever a bone was laid bare, they believed that it muſt exfoliate before it could heal. Until they ſaw the exfoliation perfect, till the bone had at leaſt thrown off an outer ſcale, they would not permit it to heal. They would not lay the ſkin down in a wound over the ſhinbone. If there was a lacerated ſcalp, they cut the torn piece off; a large part of the ſcalp cannot be regenerated in leſs than ſeveral weeks or months, and thus they confirmed their opinion by their practice; for very generally in that ſpace of time the whole, or a part at leaſt, of the expoſed bone was thoroughly ſpoiled. Theſe were a few of the miſtakes committed daily by the older ſurgeons, who were well contented with their own theories about incarning and cicatrizing of wounds; too proud of their art, and too little inclined to follow the ſimple ways of nature.

The diſcuſſions which took place among ſurgeons concerning amputation, and particularly the flap operations, firſt contributed to the univerſal introduction of the doctrine of adheſion. The French ſurgeons, who firſt invented the flap amputation, declared not only that their flap amputation procured an eaſy and perfect cure, but that often in three days the fleſh of ſuch a ſtump had adhered. To this O'Halleran replied, with a rudeneſs and ignorance quite unparalleled. "I would aſk," ſays he, "the moſt ignorant Tyro in our profeſſion, whether he ever ſaw or heard even of a wound, THOUGH NO MORE THAN ONE INCH LONG, united in ſo ſhort a time." "Theſe tales are told," he adds, "with more confidence than veracity. Healing by inoſculation, by the firſt intention, by immediate coaleſcence without ſuppuration, is merely chimerical, and oppoſite to the rules of nature." This was the aſſertion of O'Halleran, himſelf an excellent and moſt judicious ſurgeon; and all the beſt ſurgeons of the preſent day, as Mr. White, Broomfield, &c. have followed his doctrine and practice, viz. that of dreſſing their circular ſtumps, with rolls of fine linen laid within the circle of the ſtump; and when they amputate by the flap operation, they dreſs the flap and the face of the ſtump as ſeparate ſores till the twelfth day.

When O'Halleran talked this bold uncivil language about confidence and veracity, he little thought that he ſhould live to ſee the doctrine of adheſion followed by a univerſal practice of laying down the flap, and the moſt ordinary ſurgeon procuring ſometimes a perfect adheſion on the third day. But ſurgery has im-

proved gradually within theſe twenty years; obſervations have been carefully made and publiſhed in pamphlets or journals; doctrine and practice have gone hand in hand. The particular practice of procuring adheſion belongs to no one perſon, but has been paſſing continually from hand to hand, from one friend to another, the common doctrine and diſcourſe of the day; the practice gradually becoming more extenſive in its application, has gained ſtrength, like every practical doctrine, by ſlow degrees. It was applied firſt to amputation, then to trepan, then to the extirpation of ſchirrous mammæ, then to all great operations, laſtly to all recent wounds. If we are more particularly indebted to any one man for the application of this doctrine to amputation, it is to Allanſon, who continuing through all his practice to make neat operations, and careful notes, has given us the reſult in a form and language which makes his writings, notwithſtanding the nature of his ſubject, as pleaſant almoſt as they are profitable to read; and yet (as O'Halleran ſays on another occaſion, p. 222.) "We muſt not wonder to find ſome people ſcarcely known beyond their own ſphere of action MODESTLY whiſpering their claim to this honour;" a quotation which, in its ſenſe and true meaning, may be fairly applied, excepting one word, to a certain modern ſurgeon *.

* Which of theſe words, my reader ſhall ſtrike out, I ſhall leave to his own honour and good ſenſe to determine, after he ſhall have read the following quotation; obſerving, in the firſt place, that Mr. O'Halleran publiſhed his book chiefly with the deſign of teaching ſurgeons how to ſave ſkin: That Mr. Allanſon publiſhed his book to teach ſurgeons how to put that ſkin down ſo as to make it adhere; and that a third author, the only modern ſurgeon who has formally claimed the doctrine, is the only modern ſurgeon who does not underſtand its real value. He delivers the following curious hiſtory of this doctrine of adheſion:

"As I conſider the improvement by which theſe ends are effected as one of the moſt important in modern practice, I hope to be excuſed if I ſhortly ſtate the ſhare I have had in the introduction of it, before proceeding to deſcribe the operation itſelf.

"In the courſe of my education, while attending the hoſpital here as well as the hoſpitals of London and Paris, the inconveniencies ariſing from the want of attention to the ſaving of ſkin in different chirurgical operations ſtruck me ſtrongly, ſo that I was reſolved to take every proper opportunity in my own practice of treating this point with particular attention.

"From the year 1772, when I ſettled in buſineſs, I laid it down as a maxim, not to be deviated from, to ſave as much ſkin and cellular ſubſtance in the removal OF TUMORS, WHETHER CANCERS OR OTHERS, when the ſoundneſs of parts admitted of it, as would completely cover the SORES, &c.

"After this had been practiſed for ſeveral years, Mr. Allanſon of Liverpool, in the year 1779, publiſhed ſome obſervations upon amputation, in which a method of operating is deſcribed, &c.

"The claiming ſo late as 1772, or rather 1788 (for that is the date of Mr. Bell's firſt edition), a diſcovery, viz. that of ſaving ſkin in operations, which was publiſhed by O'Halleran in 1765, muſt excite ſome feelings very different from reſentment; but any one who claims in 1788 the doctrine of ad-

I have been at pains to repreſent this improvement as gradual and ſilent, as having obtained by general and common conſent, by a ſlow communication of remarks from friend to friend, till at laſt the practice was fairly eſtabliſhed; and no man could fully claim an improvement, in which every man had ſome little ſhare. But if ſurgery be indebted to any particular perſon for the invaluable improvements which this doctrine of adheſion has brought along with it, it is to Mr. Hunter and the London ſchool.

This univerſal doctrine and practice of procuring adheſion, has done more for ſurgery in a few years, and moſt eſpecially for the ſurgery of wounds, than any other general obſervation, not excepting even the greateſt of all diſcoveries, the circulation of the blood. It is now well proved, that ſkin will adhere to ſkin, fleſh to fleſh, bone to bone, and all theſe parts to each other. One part only of the human body, cartilage, will not adhere. I have ſeen many proofs that cartilage does not inflame, nor ulcerate, nor give out granulations, nor generate new fleſh, or, at leaſt, it does ſo very ſlowly. A wound heals over a cartilage, but not by uniting with it. We amputate a toe at the joint, and the flaps unite in two days; but ſtill they have united with each other only, and not with the cartilage

heſion, which Allanſon had ſo fully explained in the 1779, ſhould be anſwered, and the anſwer is plainly this, that ſeveral other paſſages of the ſame author ſhow that he did not even underſtand what Mr. Allanſon was doing. For example,

"When ſpeaking of the time in which ſtumps may be expected to heal, I think it right to obſerve, that it ſhould not be our object to accompliſh a cure in the firſt inſtance, without the formation of matter; it commonly anſwers better when effected in the more gradual manner we have pointed out. When a ſtump heals ſuddenly, and the edges of the divided ſkin adhere by the firſt intention, the teguments are apt to be puckered and uneven, and the ligatures of the arteries are removed with difficulty, &c.

"It was my own opinion that the SECONDARY UNION, recommended by Mr. O'Halleran, is the beſt; the cure would appear to be in general accompliſhed more quickly in this way than in any other. Even where the flap has not been applied to the ſore till the FOURTEENTH DAY, the cure has been completed before the fourth week; whereas, few if any cures have been effected ſo early, where the flap has been applied immediately after the operation."

A man who has invented a doctrine, very generally underſtands it, at leaſt as well as his neighbours, and puſhes his diſcovery rather beyond the mark. But this author "cares not whether the ſkin be laid down for adheſion, or whether we dreſs the flap and the ſtump as two diſtinct ſores. In ſhort, far from ſpeaking in the enthuſiaſtic paſſionate tone of one pleading for his own diſcovery, we may know that this does not belong to him, by the very token which diſcovered to Solomon which of the two harlots was the mother of the living child; "for behold one of the women ſaid, nay, but let it be neither thine nor mine, but divide it."

of the joint; and in a luxated limb, we find that the bone continues diſplaced, the cartilage never inflames, never unites with the lacerated parts, never in any circumſtances adheres; for the proceſs of adheſion is really this. Either the arteries of oppoſite ſurfaces inoſculate mouth to mouth; or, rather, each cut ſurface throws out a mucus, the leſſer arteries of each cut ſurface elongate themſelves, ſtretching into this mucus, and it is thus, or perhaps by the generation of a new intermediate ſubſtance, that the continuity and entireneſs of the part is ſo quickly reſtored. If any one point fail to adhere, there the wound muſt run into ſuppuration, becauſe at that point there is a ſeparation of parts, which, being equivalent to a loſs of ſubſtance, requires the generation of new fleſh.

When the oppoſite ſurfaces conſent and harmonize with each other in their mode and period of action, then they immediately adhere; and ſo ſkin adheres to ſkin, fleſh to fleſh. But if one of the oppoſite parts enters inſtantly into a lively action, while the other has only a languid action, and enters into that action ſlowly and at a long interval of time, the action of the one has expired before that of the other has begun; ſuch parts, therefore, do not conſpire nor harmonize in their action; nor can they unite with each other, but they may live and thrive independently of each other; and, perhaps it may happen in this way, that oppoſite ſurfaces of ſkin or muſcle may ſeem to be adhering firmly to the parts beneath them, while they adhere to each other only, and merely cover the cartilage or bone, without having any direct connection with thoſe parts. The bone (as we ſee in an old amputated limb), lives and thrives, is not limited in its new formation by the adheſion of ſurrounding parts, but grows out into a broad knob of callus or new bone. A griſtle alſo (as in an amputated or luxated joint) retains its pure and lubricated form.

There are no doubt accidents both of the conſtitution and of the wound which will prevent adheſion; for if the patient be of a bad habit of body, if he be lying in a foul hoſpital, and breathing infected air, if he be ill of a fever or flux, or any general diſeaſe, then the properties of the body being leſs perfect, his wound will not adhere; or if the wound be foul, made with a poiſoned weapon, or left with foreign bodies ſticking in it; or if blood be poured out into the cavity of the wound (for blood, in this caſe, is but a foreign body *); or if there be a wounded lymphatic, or wounded ſalivary duct, a wounded inteſtine, or a

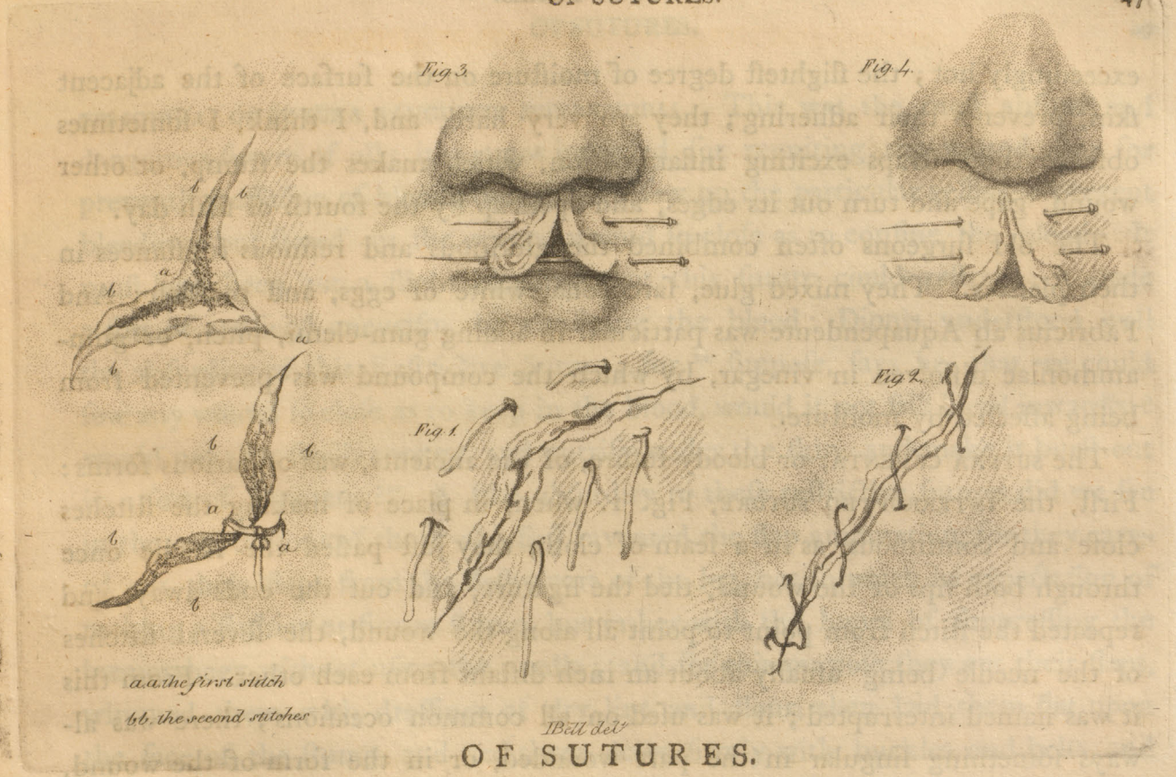
* It is not eaſy for any one who is not an enthuſiaſt in the "doctrine of life in the blood," to acknowledge all the very extraordinary concluſions which have been deduced from it.

bleeding artery or vein, any of theſe cauſes will prevent the immediate adheſion of the wound; or if it be a bruiſed or gun-ſhot wound, and there is a deſtruction of parts, the loſt parts muſt be regenerated, and thoſe parts which remain muſt enter into a new action for generating new parts, and ſo cannot adhere.

This adheſion, then, is a property of the parts of the living body, which is perfect only while their ſtructure is entire, which operates only where the oppoſite parts touch each other by the fulleſt contact, and ſympathize with each other in their period and degree of action. Adheſion is interrupted if any foreign body be interpoſed; it is leſs perfect in every unhealthy condition of the ſyſtem; but it is a property of which we are now ſo well aſſured, that we look for its good effects in the greateſt as well as in the ſmalleſt wounds; and the union of a hare-lip, after it has been cut and pinned, repreſents the perfection of that cure which we attempt in every greater operation, and more confidently in every ſmaller wound, ſucceeding ſometimes as perfectly after an amputation of the thigh, as after the moſt trivial cut in the cheek.

This property of reunion in divided parts is proved by every day's experience to be ſo perfect, that where we do fail (which no doubt is ſometimes owing to a bad habit of body), we have much reaſon to ſuſpect ſome negligence on our own part, ſome extravaſated blood, ſome open artery, ſome portion of detached bone left in the wound, or ſome awkward piece of dreſſing laid in betwixt the edges of the wound; we have reaſon, in ſhort, to blame the want of that abſolute contact which is ſo eſſential to perfect adheſion; for every part of a wound which does not touch ſome oppoſite ſurface muſt ſuppurate before it can heal; and this is my chief motive for putting down carefully, in ſhort diſtinct rules, the ſeveral ways in which the ſides of a wound may be brought together, ſo as to adhere perfectly.

There is no wound in which we may not try, with ſafety, to procure this adheſion; nothing ſurely can be more kindly, when applied to a wounded ſurface, than the oppoſite ſurface of the ſame wound. It has been but juſt ſeparated; it may immediately adhere to it; though it do not adhere, no harm is done; ſtill the wound will ſuppurate, as kindly, as freely, as if it had been roughly dreſſed with dry LINT, or ſome vulnerary balſam or acrid ointment.




# OF SUTURES.

Surgeons have practiſed all imaginable methods for the uniting of wounds; and very proud they have been of their ſutures, and ſtill prouder of the names they have given them. The great diſtinctions have been, the Sutura Sicca, and the Sutura Cruenta, the dry and the bloody ſuture; the one made with plaſters, the other with the needle.

The SUTURA SICCA is made ſometimes with gum, as in our common court plaſter, which is merely gum-arabic, with a little laudanum added to it (and a very fooliſh addition this laudanum is), and ſpread upon black ſilk. The older ſurgeons often uſed glue, ſometimes they uſed common glue made of ſkins, ſometimes fiſh glue, ſometimes whites of eggs; for we find that the aglutinative plaſters of the old ſurgeons took two hours in drying, which ſhows that they were merely made of glue. But theſe are diſſolved by the moiſture which flows from a great wound; therefore, in amputation, and all great wounds, we are obliged to betake ourſelves to adheſive plaſters, made of wax, reſin, and oil; though ſtraps of that kind are far from being pleaſant to uſe; for they muſt be applied

This marginal plate repreſents the various ſutures uſed by the modern ſurgeon; and as each ſuture is deſcribed, the particular figure in this plate explaining ſuch ſuture will be marked.

exceedingly hot; the ſlighteſt degree of moiſture on the ſurface of the adjacent ſkin, prevents their adhering; they are very hard, and, I think, I ſometimes obſerve thoſe ſtraps exciting inflammation, which makes the ſtump, or other wound, gape and turn out its edges, and open up by the fourth or fifth day.

The old ſurgeons often combined the glutinous and reſinous ſubſtances in their plaſters. They mixed glue, ſarcocolla, white of eggs, and maſtich: And Fabricius ab Aquapendente was particular in adding gum-elemi, pitch, or gum-ammoniac diſſolved in vinegar, by which the compound was prevented from being affected by moiſture.

The SUTURA CRUENTA, or bloody ſuture, of the ancients, was of various forms: Firſt, the INTERRUPTED SUTURE, Fig. 1. when, in place of making the ſtitches cloſe and continuous, as in a ſeam of cloth, they juſt paſſed the needle once through both lips of the wound, tied the ligature, and cut the ends away, and repeated the ſtitch from point to point all along the wound, the ſeveral ſtitches of the needle being uſually about an inch diſtant from each other. From this it was named interrupted; it was uſed on all common occaſions; there was always ſomething ſingular in the part wounded, or in the form of the wound, when they propoſed uſing any other manner of ſewing.

Secondly, The CONTINUED SUTURE, Fig. 2. when the ſtitches were made all with one thread cloſe, and ſucceeding each other regularly, as in ſewing a piece of cloth. Sometimes they ſtruck the needle through both ſides at once; ſometimes they paſſed the needle through the outſide of one lip, and the inſide of the other; ſometimes they paſſed the needle, at each turn, from the inſide of the wound only, and that in both lips, whence there was a continual croſſing of the thread, and the wound was plaited, ſo that when the ſewing was finiſhed, the ſeam reſembled that of a hand-ball; this is examplified in the common manner of ſewing up the abdomen, after opening a ſubject. This continued ſuture was called the Glover's Suture, the Currier's Suture, (Sutura Paripelliorum); the Shoemaker's, or the Tailor's Suture, according to the peculiar manner in which it was performed.

Thirdly, When the continued ſuture was uſed in ſewing up wounds of the belly, it was called GASTRORAPHY; when the ſame continued ſuture was uſed in ſewing a wound inteſtine (though I cannot find that any ſuch operation ever was actually performed), they called it ENTERORAPHY; and when this ſuture was made very firm and cloſe, to prevent bleeding, they called it the SUTURA RE-

STRICTIVA, or SUTURA SANGUINIS SUPPRESSORIA. This was the moſt abſurd and dangerous ſuture of all; it was not intended for reuniting the wound, but for preventing effuſion of blood; they did not ſew up the particular veſſels to prevent bleeding, but ſewed up the general wound ſo cloſe as to confine the blood. It muſt have been but a ſlight bleeding that this ſuture could reſtrain; it made a ſort of artificial aneuriſm, by confining the blood; Dionis underſtood well the abſurdity of this Reſtrictive Suture; for "ſuppoſe, ſays he, that we could ſew any wound ſo cloſe as to keep in the blood, would it not ſtill bleed inwardly? would not that ſwell, corrupt, and putrify under the ſkin, and make it burſt out in a ſort of gangrene?" A like abſurdity to theſe reſtrictive ſutures did we ſee in the expectations of thoſe who firſt invented the flap amputation, for they carved out their flaps from the fleſhy part of the leg, not ſo much in expectation of making a fleſhier or firmer ſtump, but rather with the hopes of ſuppreſſing the hæmorrhagy without uſing the needle; and for this purpoſe they cut their flaps, trimmed them with dreſſings of dry lint and flour, then laid them flat upon the face of the ſtump, and tied them down firmly with buckles and belts, and all kinds of machinery *.

Fourthly, The HARE-LIP SUTURE was ſo named from its being chiefly uſed after operating for that deformity, is one of the few which we have retained. This ſuture is made by thruſting pins or needles through both lips of a wound, and twiſting a fine thread round the projecting ends of the pins, whence it is named very often the TWISTED SUTURE †.

* "The way," ſays Wiſeman, "to ſtop the bleeding, as it is common in all wounds, is by bringing the lips of the wound cloſe together by ſuture, and by applying ſuch medicaments to them as have a drying and agglutinative faculty." Theſe notions our older writers got from the celebrated French ſurgeon Guido de Cauliaco, who ſays, "futura reſtrictiva ſit quando aliæ ſuturæ non fieri poſſunt propter magnum ſanguinis impetum." And he adds, that this after all is not a ſuture to be depended on, for if but one ſtitch burſt, the whole gives way. "Suſpecta tamen eſt quia rupto uno puncto, cetera relaxantur."

Guy de Chauliac had in his turn copied from the Arabians in moſt points, and very expreſsly in this buſineſs of ſutures; ſo that we find the reſtrictive ſutures to have begun with the Arabians, who knew the way of uſing the needle in cloſing wounds, but had not learnt to uſe it in tying arteries, otherwiſe than by ſewing the wound juſt ſo much the cloſer and tighter in proportion to the bleeding. They directed the ſuture to be made cloſe and firm, like that which the currier makes when he mends breaches in the tanned ſkin.

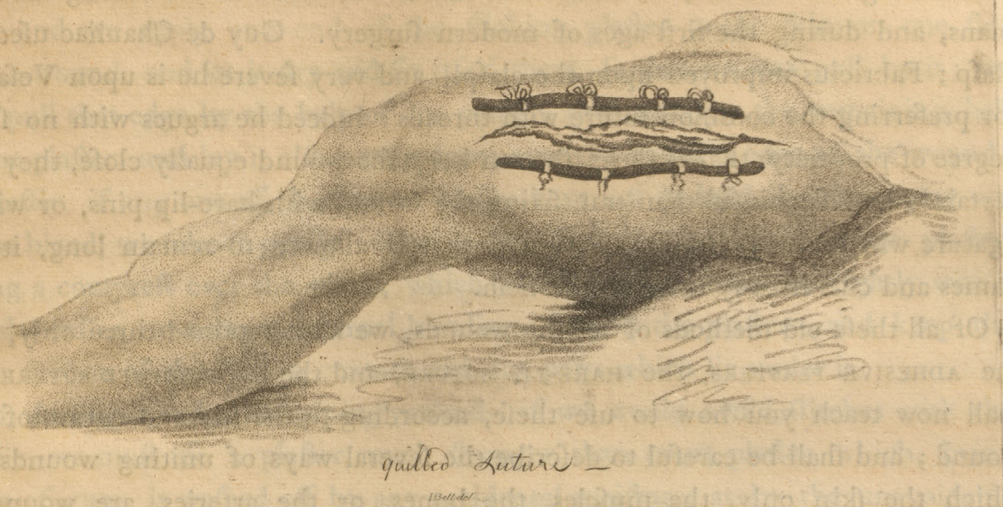
† I have drawn two figures, one to ſhow the proper manner of putting in the pins, the other to ſhow a very common error, which is, that often, as in fig. 4. the lower pin is put in a little way from the loweſt or red part of the lip, the conſequence of which is, that a conſiderable part of the lip fails to be reunited;

Fifthly, When the wound was deep among the muſcular fleſh, the old ſurgeons imagined that ſo large a wound could not be commanded by the common interrupted ſuture, however deep the ſtitches might be driven among the fleſh; they were beſides fearful of uſing the continued ſuture in deep gaſhes, leſt the wound ſhould be made to adhere ſuperficially, while it was ſtill open within, forming perhaps a ſuppuration and deep collection of matter. They believed that a great muſcular wound could not be ſafely healed without a degree of ſuppuration, while they wiſhed to bring it together at the bottom, they were afraid to cloſe it very exactly at the mouth, leſt the matter ſhould be collected in the deeper parts of the wound; it was for this purpoſe that they uſed what they called the COMPOUND SUTURE, or the QUILLED SUTURE. It is merely the INTERRUPTED ſuture, with this difference, that the ligatures are not tied over the face of the wound, but over two quills or rolls of plaſter, or bougies which are laid along the ſides of the wound. In performing this ſuture, we make firſt two, three, or four ſtitches of the Interrupted Suture very deep, and then all the ligatures being put in, we lay two bougies along the ſides of the wound, then ſlip one bougie into the loops of the ligatures on one ſide, drawing all the ligatures from the other ſide till that bougie is firmly braced down; next we lay the other bougie, and make the knots of each ligature over it, and draw it alſo pretty firm; and thus the ligatures, in form of an arch, go deep into the bottom of the wound, and hold it cloſe, while the bougies or quills keep the middle of the wound and the lips of it preſſed together with moderate cloſeneſs, and prevent any ſtrain upon the threads, or any coarſe and painful tying acroſs the face of the wound *.

but in figure 3. I have ſhown the loweſt pin introduced as it ſhould be, ſtruck through the very loweſt point of the lip, and introduced firſt, ſo as to ſecure the oppoſition of the loweſt points of the cut edges, for on that chiefly depends the deformity or neatneſs of the ſcar.

* Dionis reprobates this quilled ſuture in very violent terms; but his annotator, De la Faye ſays, it is good, eſpecially in deep muſcular wounds, and that it was approved of by every good ſurgeon in his day. This quilled ſuture we hardly ever uſe; it is not indeed uſeful; perhaps in wounds of the belly it might do ſome ſervice.

Fig. 3.



quilled Suture

Sixthly, The fibula or clafp is an old manner of uniting wounds wonderfully little known. The lips of the wound, inftead of being fewed, were laid clofe together, and then kept in that ftate by a clafp, which was made thin and elaftic to bend to the fhape of the part, and had hooks at each end which were fixed into the flefh on the fides of the wound. Celfus is fuppofed to have mentioned thefe clafps, though fome imagine that he meant merely the loops of common ligatures. But the Fibulæ or Agraphs of the French and Latin authors are mentioned in books too near the times of Celfus to leave us in any doubt; it is not unreafonable to fuppofe, that along with the books, the operations of the ancients were revived by the Arabians, who muft alfo have had traditions concerning the particular methods in ufe in the times of Celfus. Oribafius, in explaining Celfus, defcribes the Fibulæ as made of iron, gold, or brafs, fomewhat in the form of thofe with which the cloak was faftened. Guido de Cauilaco calls them hooks, fmall, elaftic, and crooked, to take hold of the lips of the cut wound. Fallopius, who fays that Celfus meant merely the threads of common futures, forgets that Celfus, in many places, fays, "fibulis impofitis, fibulis additis," expreffions quite inconfiftent with this conjecture*. But whether the fibula, was or was not

* The clafp is defcribed by Veſallius in the following terms: "Quinto et ultimo, hæc futura fit Fibulis, disjunctos atque hiantes vulneris oras committentibus; quæ quidem fibulæ vel majores aut minores, exiſtant, pro ratione ac differentia vulneratæ particulæ, ſed ab utraque parte incurvæ, unuſque hammus in altero vulneris labro infigatur et verſus alterum tendat, in quo et alter hammus eodem modo fixus ſit; ut facere ſolent qui pannos tundendo ſolent," p. 982.

uſed among the Romans, we know well that it was much in uſe among the Arabians, and during the firſt ages of modern ſurgery. Guy de Chauliac uſed the claſp; Fabricius improved upon the claſps, and very ſevere he is upon Veſallius for preferring the common ſuture with threads: Indeed he argues with no ſmall degree of propriety, that if the claſps can keep the wound equally cloſe, they will certainly be leſs painful than transfixing the wound with hare-lip pins, or with a ligature which always becomes ſo tenſe, that if allowed to remain long, it inflames and cuts its way through the fleſh.

Of all theſe old methods of ſewing wounds, we have retained three only, viz. the ADHESIVE PLASTERS, the HARE-LIP SUTURE, and the INTERRUPTED SUTURE. I ſhall now teach you how to uſe theſe, according to the ſize and nature of the wound; and ſhall be careful to deſcribe the ſeveral ways of uniting wounds, in which the ſkin only, the muſcles, the bones, or the arteries, are wounded. Theſe operations I ſhall endeavour to deſcribe, ſo as to give each accident the effect of a particular caſe; and this, I hope, will prepare you in ſome decided manner of proceeding, appropriated to almoſt every individual caſe that may occur.

## RULES FOR THE REUNION OF WOUNDS OF THE SKIN.

1ſt, Except in thoſe cuts which are ſo ſlight as only to require a cloth to be wrapped about the part, every wound ought to be ſewed; for I have obſerved, that though we put the parts nicely together with compreſs and rollers, if the needle have not been uſed, we are never ſure of the parts being in abſolute contact; we are often diſappointed; and when we undo the wound, find it in a ſtate of ſuppuration; yet there are ſmall cuts where it is unneceſſary to paſs a ligature with the needle. Wherever the cut is clean, direct, without angles, and the ſkin not much ſeparated from the parts beneath, and eſpecially when it lies flat and firm over a bone, as on the head, hand, &c. we unite the lips of the wound with a plaſter of gum arabic, or commom black court plaſter cut into ſlips; and in applying ſuch a plaſter, we are careful firſt to let

The claſp was made of various faſhions, ſometimes like two hooks joined together, ſometimes like a claſp for the ſhoe, or like a Roman fibula, or like a ring for inſibulating boys, but always it was made thin and elaſtic that it might bend to the form of the part.

the bleeding ſubſide, then an aſſiſtant puts the lips of the wound neatly together, and we apply one end of the ſticking plaſter to the ſkin on one ſide of the wound, and let it dry and fix itſelf there, ſo that we may pull by it; we next pull that edge by the help of the plaſter, then moiſten the remaining half of the plaſter, and lay it alſo neatly down over the oppoſite edge of the wound; and laſtly, if any one of the ſlips of plaſter have loſt its hold, by the oozing out of the blood, we take it gently off, wipe the ſurface, and apply a new plaſter, laying a compreſs over the whole, which we bind down ſomewhat tightly with a circular roller, to prevent internal bleeding, ſupport the plaſters, and keep the inner ſurface of the ſkin in contact with the parts which lie under it.

2d, In larger and more gaping wounds, if we would avoid ſtitches with the needle, we muſt uſe a plaſter much ſtronger than court plaſter, which, being made of gum, is waſhed off by any accidental moiſture, as by the unavoidable oozing of blood or ſerum from the lips of a large wound. The older ſurgeons paſted two plaſters very firmly, one on each ſide of the wound, (vide Fig. 7. p. 59.). The plaſters were ſpread with a compoſition of Colophony, Maſtich, Reſin, Sarcocolla, &c. mixed with the white of an egg to the conſiſtence of honey, and were allowed half an hour to harden and adhere to the ſkin *; and then, by ſtrings fixed in the edges of each plaſter, the lips of the wound were drawn very nicely into contact, and kept ſo without pain.

Sometimes we uſe plaſters with ſtrings to ſupport ſtitches of the needle, or to draw forwards the cheeks in operations for hare-lips, where there has been a great ſeparation; and ſometimes we uſe ſuch plaſters with uniting bandages to ſupport the ſides of great fleſh-wounds, where there has been conſiderable loſs of ſubſtance.

3d, In cuts of the lips or cheeks, much neatneſs is required, as indeed in all ſutures; but here eſpecially, ſince a ſlight irregularity in the lip is a great deformity, and a great reproach to the ſurgeon. In the lip we can have no ſecurity but from the firmeſt kind of ſuture; the lip hangs looſe, and is quite unſupported on its inner ſurface; it is very dilatable; it moves with the ſlighteſt motions of the mouth or jaws, and it is ſo ſtrongly retracted in laughter and

* "Quibus paratis, lintea ex una parte glutino illinenda ſunt, et utrinque prope vulneris labia, ut intervallum ſit tranſverſus digitus, et aliquanto minus, per totam vulneris longitudinem applicanda; adhærent enim ſtrenue cuti intra HORÆ DIMIDIUM SPATIUM applicata: tuncque licet trahere invicem habenulas ex contrariis partibus, et per anſulas alligare." FABRICIUS.

other emotions, by the muſcles of the cheek, that it muſt be particularly well ſecured. Though ſome have pretended to reunite the hare-lip by plaſters, I know that, even in a grown perſon, nothing will ſecure it but the pin. In accidental cuts, we operate exactly as after operations for hare-lip, or for cancer; we take the pin, fixed in the inſtrument called Porte-aiguille, in the right hand, and holding the edges of the lips together with the fingers of the left hand, transfix both lips with the pin, at points exactly oppoſite to each other, puſhing the pin with the right hand, and reſiſting and managing the lips with the left; we paſs two pins, one exactly in the tip of the lip, through the red and fleſhy part (for that ſecures the evenneſs and juſt form of the lip), and another through the middle of the lip, and then twiſt the waxed thread round both pins firmly, but gently, in the form of a figure of 8.

The pins ſhould be drawn out the ſecond day; they are uſually left too long; and the tenſion of the pins occaſions a ſuppuration, a puckering of the wound, and a viſible ſcar. Pins are recommended in other wounds of the face, eſpecially in wounds of the cheek; but this kind of ſuture ſtrains the parts too much, is apt upon any ſlight inflammation to burſt its hold, often it leaves a mark, and is in no caſe a good ſuture, except in the ſingle inſtance of a wound in the lip. Yet, perhaps, in the caſe of the eye-lid being cut by accident, or by the ſurgeon for the purpoſe of cutting out tumours from the ſocket, the hare-lip ſuture may be uſed. In theſe caſes I have uſed a fine ſlender White Chaple needle with great advantage; and indeed I think a common ſewing needle, or a glover's needle, which is triangular, preferable in any caſe to the gold pins *.

4th, In cuts of the face, of the ſcalp, of the ears, noſtrils, or lips, of the throat, or even of the tongue, we uſe in general a ſingle ſtitch of the Interrupted Suture; and the caſes in which more are required do not often occur, though ſometimes we meet with them. A man, for example, whoſe horſe falls with

* The firſt time that I uſed a common needle was, when one boy had quite divided another's lip with a blow of the bat. I found it go in quite eaſily with the fingers alone. Mr. Petit ſpeaks of a long and ſlender kind of needle common in France, called the Queen's Needles, and thoſe he always uſed in preference to any thing he could get in the cutlers ſhops. If a porte-aiguille, as it is called, or inſtrument for holding and introducing the needle were required, I do not know that a neater or better could be found than the handle of the common tambouring needle. But in place of any inſtrument, I think hare-lip pins are beſt introduced with the fingers, and ſhould have large heads like thoſe of the largeſt common pins, and delicate points; and I have no heſitation in preferring ſteel pins or needles, a little tempered, to gold ones, which are very awkward.

him, being thrown from the horſe with great violence, his face lighting among ſharp ſtones, is disfigured with various cuts, each of which requires a ſeparate ſtitch; or the cut is irregular, of an angular form, and requires a ſtitch at each angle. Sometimes a ſabre cut extends, as it were, along the whole face, or croſſes it obliquely; begins in the cheek, croſſes the noſe, and almoſt divides the lip. In ſuch a caſe, we put in a ſtitch firſt in the wing of the noſe, as being a point, the regularity of which we are anxious to ſecure, then a ſecond ſtitch near the tip of the noſe, with a very fine needle and thread; then a ſtitch in the angle of the lip, then another ſtitch to hold up the middle of the lip, then another in the middle of that part of the cut which extends along the cheek; and the gaps between each of thoſe ſtitches we croſs with ſlips of ſticking plaſter. Nor ſhould the ſurgeon be afraid that the number of ſtitches, or the cloſeneſs of ſuch a ſuture, will excite inflammation; the wound will inflame only at the little points, where it chances to remain ill cloſed; it is the reunion of parts that reſtores them to their healthy ſtate, and effectually prevents inflammation *.

But the ſtitching of ſuch a wound requires very particular niceneſs; and I will endeavour (as far as rules will go) to teach you the neceſſary precautions:

* "Whilſt I ſerved amongſt the Dunkirkers, where Snick and Snee was as it were a faſhion, I had much of this ſort of work; and, for your diverſion, ſhall ſet you down one inſtance in that kind.

"Whilſt our ſquadron rode at anchor in the Groin, there came in ſome Hollanders, under the notion of Hamburghers, with three ſhips new trimm'd up for the King of Spain's ſervice. A boatſwain of one of theſe ſhips happened in company aſhore with ſome of our men, where drinking together, the Hollander began to prate of religion, upbraiding one of our men for wearing a croſs; and after a while, growing more heated with drink, he became quarrelſome, and ſwore Sacrament he would not wear a croſs; no, the devil take him, repeating it often. One of our men beat him down, and fell with him; then kneeling upon his breaſt, and holding his head down, he drew out a knife ſticking in his ſaſh, cut him from the ear towards the mouth, then from the os zygoma to the nether jaw. Now, ſaid he, you ſhall wear a croſs, that the devil do not carry you away. I was ſent for from the next houſe as a friend to that religion, and ſtitched the lips of the wound cloſe together; then ſprinkling them with a little pulv. Galeni, applied pledgits with a ſarcotic unguent, and with aſtringents and bandage dreſſed him up. The next morning he was let blood, and the third day after I took off the dreſſings, and finding the wound as it were agglutinated in the ſlits, I cut out ſome of the ſtitches, ſprinkled the wound as at firſt, and dreſſed him up with ſarcotics, with compreſs and bandage. The ſecond day after I dreſſed him again, and cut out the remaining ſtitches; and in a dreſſing or two more cured him. This being the work of nature, who rarely faileth in acting her part, if we perform ours, in retaining the lips cloſe together, and defending them from fluxion. The patient was well pleaſed with his cure, though there remained ſome marks of a croſs. Theſe ſort of people wearing them with much pride in their faces, as marks of their courage."

WISEMAN.

Let your needles be ſmaller and nicer than they are uſually made, leſs curved, and flat, with two very fine cutting edges: Let your threads alſo be ſmaller than they are commonly uſed, and not ſo groſsly waxed, for that makes them ſtiff and awkward to draw: Let them be a little waxed, in order to flatten, and unite the two threads; but draw them afterwards through your fingers dipped in oil, in order to make them glide through the fleſh. Allow the bleeding to ceaſe entirely; if it do not ſtop uſe an aſtringent, as vinegar and water; leave the cut expoſed to the air a little, till the bleeding ceaſe, the ſurfaces grow ſore, and begin to ſmart, and the lips become dry; be in no hurry. Make a ſtitch of the needle at each angle of the wound; repeat your ſtitches, one for each inch in length of the wound; draw them till they make the points approach; and having tied your ſeveral ſtitches, croſs each intermediate point with a ſtrap of ſticking plaſter; and take notice that the ancients were ſo careful as to cloſe up the whole line of the wound, by pouring upon it a vulnerary balſam, which balſam was not a quackiſh ſenſeleſs invention; it was what they called Eſſence of Maſtich, or the eſſence of ſome other gum; in ſhort it was a ſpirit-varniſh which they poured over the wound; it hardened upon it in the form of a ſheath; the part was thus encaſed in a ſort of mould, which was not waſhed off till after four or five days, when the cure was perfected. Sometimes they varniſhed the wound with whites of eggs in place of a balſam. Often they ſtrewed over the wound powders of aloes, myrrh, and maſtich; and theſe gums being moiſtened from time to time with a little ſpirits of wine, diſſolved firſt, and then hardened into a cake, ſo that this was equivalent with pouring the balſam or varniſh over the part.

5th, Although the lip, noſe, ear, or chin, be almoſt entirely cut off, though the part have turned down, and hangs by the ſmalleſt portion of fleſh; you are not to deſpair of reuniting it; you are to lay it up again, fix it with a ſtitch or two, dreſs it very cloſe, put a pad of ſoft lint over it, and make all ſure with a bandage adapted to the part *. It is wonderful how parts will unite after they ſeem to be irrecoverably ſeparated, inſulated to all appearance, and ſeemingly deprived of any adequate ſupply of blood.

6th, If the tongue be partly cut acroſs, as by falling on the chin when the tongue is lolling out, or by convulſions, (the tongue being checked between the teeth), or

* See the Chapter on Bandages, where there are drawings of proper bandages for the face, noſe, chin, &c.

by ſhot, the part which is divided may be joined with a ſtitch of the needle; while, at the ſame time, the tongue may be confined with a bandage like that invented by Mr. Pibrac for a young lady, who had ſeveral times cut her tongue in fits of epilepſy *.

7th, In wounds of the ſcalp, the old ſurgeons were afraid to uſe the needle, though, in truth, the advantages of ſewing the ſcalp are infinite, and the danger is as nothing. This rule, of never ſewing wounds of the ſcalp, proceeded from ignorance and extreme prejudice; and perhaps their apprehenſions (which were ſo ſtrong, that this rule became univerſal and abſolute); perhaps, I ſay, thoſe apprehenſions aroſe from their obſerving how often wounds of the ſcalp went wrong, not conſidering, that ſuch diſaſters enſue rather from ſome more eſſential injury, as of the bone, or of the brain itſelf, than from ſo trivial a hurt as the ſtitches of the needle.

It is unqueſtionably leſs neceſſary to make ſtitches, or, at leaſt, to make many ſtitches, in wounds of the ſcalp, than in wounds of any other part of the ſkin, for the ſcalp reſts upon a firm bone; and a piece of court plaſter, a compreſs, and a well rolled bandage, are often ſufficient to keep the wound firm and right; but wherever the ſcalp has been largely wounded, it muſt be ſewed. The ſewing reunites the edges to each other, and fixes the ſeparated parts to the cranium; by thus reſtoring the continuity of the parts, we preſerve them all in health and full circulation, we ſave the bone from exfoliating, and the

* This drawing, Fig. 6. repreſents the bandage which Mr. Pibrac found very uſeful to him in the caſe of a young lady who had bit her tongue almoſt acroſs in a convulſion fit. Obſerve firſt, that ſtitches may be put into the ſubſtance of the tongue, as into any other part, with perfect ſucceſs. In this way Paree cured three people who had their tongues almoſt entirely cut acroſs. And, ſecondly, that I think a bag of this kind for receiving the tongue, the bag being held back in the mouth with this wire, marked (a a), and fixed by a ſort of collar round the neck, muſt be uſeful both to preſerve the tongue, and alſo to ſerve as a gag, and prevent more injury in caſe of a ſucceſſion of fits; yet I

*Fig. 6.*

confeſs, the whole invention ſavours a little of that trifling manner of which many ſenſible men accuſe the French ſurgeons; it is perhaps ſomething like what we ridicule in this country by the word nick-nackery; like the needles invented by the French ſurgeons for ſewing the intercoſtal artery, or the artery of the dura mater; yet if I had not a ſuſpicion that it might on ſome occaſion be uſeful, I ſhould not trouble you with it.

brain from ſuppuration, and we ſhorten the cure. Even ſuppoſing the worſt, that the ſcalp be ſo ruined in its vital principle that it muſt fall into ſuppuration, yet the trying to unite it to the ſoft parts can (as I have already ſuggeſted) do no harm. The reunion of the ſcalp is of more importance than the reunion of other parts, in proportion as exfoliation of the ſcull, or ſuppuration of the brain, is peculiarly dangerous; therefore, you will conſider this as your rule, that in all kinds of wounds of the ſcalp, you muſt attempt the reunion by means proportioned to the nature of the wound. If it be ſmall and direct, without any great ſeparation of the ſcalp, you may unite it with plaſters, compreſs, and bandage. If the ſcalp has been rubbed off by falling among ſtones, if it has been cut down by the ſtroke of a ſabre, or if the integuments have been cut and turned back for the operation of trepan, they ſhould be ſmoothed down again, drawn together, and ſecured with a ſtitch. In boys, ſuch a ſtitch may be uſed with peculiar confidence; and in all ſuch wounds, the ſtitches ſhould be made eſpecially at the angles, and the whole wetted with a little ſpirits, or ſome other aſtringent and ſtimulant, ſo as to ſtop the blood before the wound is ſewed up.

If the wound be a triangular flap of the ſcalp turned back, as in Fig. 8. by a fall among ſtones, or by a blow, or (as I have ſeen) by a man's riding under an arch too low for him to paſs, it muſt be laid down again, and fixed with two or three ſtitches, according to its extent, as in Fig. 9. Or if we have cut up the integuments to perform the operation of trepan, and the inciſion is in the form of the letter T, as in Fig. 11. (See the plate at the end of the chapter) we paſs the needle through each of the corners of the three flaps of ſkin, and ſo draw them all nicely together with one ſtitch *. Or if the ſcalp has been torn

* This drawing, Fig. 11. at the end of this chapter, is of the head of a fine boy, SAUNDERS, about ſix years of age, who fell from a terrace nearly fifteen feet high upon pavement. His ſcull was cruelly fractured, and depreſſed to a very great extent, in a triangular form. He lay oppreſſed, vomiting, and bleeding at the noſe and ears. An inciſion of a triangular form was made through the ſcalp, and the three angles were diſſected off; the trepan was once applied, ſo as to free the corner of the depreſſed bone; the depreſſion was raiſed up; and the whole was ſecured, as repreſented in the drawing, by one ſingle ſtitch. The whole of the inciſions had entirely adhered in four days; very little was left to ſuppuration; the boy was entirely eaſy from the moment of the operation, and in ten days was able to go abroad. The operation was performed by my friend George Wood. It was no doubt an operation which any one could have performed; but I cannot omit this opportunity of ſaying, I think him the moſt dexterous operator I have ever ſeen, his father, my worthy maſter, not excepted.

back in a ſemilunar form, by the kick of a horſe, for example (as in Fig. 10.), and you have found it neceſſary to perform the operation of trepan, make two or three ſtitches with the needle, and bring the parts as cloſe as you can. I have often ſeen ſuch a wound adhere in two or three days, and heal in ſix or eight more.

RULES FOR THE REUNION OF DEEP MUSCULAR WOUNDS.

There is a degree of prudence required in the ſewing up of great muſcular wounds; for ſtitches, after all, can ſupport only the edges of the wound, while it is the compreſs and the uniting bandage that muſt ſupport all below. Deep muſcular wounds, therefore, ſhould be ſecured chiefly by the compreſs and uniting bandage. Stiches ſhould in ſuch wounds be uſed with reſerve. Thoſe who have uſed ſtitches the moſt confidently, have been forced as ſuddenly to cut them out again; a point which is well illuſtrated by the caſe of a ſoldier, who being wounded at the Corps de Garde with a ſabre cut, acroſs the ſhoulder, through the belly of the deltoid muſcle, his ſurgeon ſewed the wound that night with many deep ſtitches; theſe Mr. Pibrac was next morning obliged to cut, on account of convulſions of the arm, which ceaſed the moment that he had done ſo *. Such deep ſutures may be fairly enough compared with the croſs ſtitch of Pa-

* Memoires De l'Academie de Chirurgie.

ræus *, which killed the patient, ſometimes by convulſions, ſometimes by high inflammations, with a total gangrene of the ſtump.

Yet in all ages it has been the practice to ſew muſcular wounds. William Clowes, a good old ſurgeon, but almoſt as rude as ſkilful, was among the few in his day who ſewed wounds, and he made free uſe of this needle, however large the wounds. Being at one time highly incenſed at the interference of a meddling, bragging fellow, he relates this ſhort caſe: "A man travelling out of London to the weſt country was ſet upon by robbers, and his two cowardly companions ran off, and left him at their mercy. The chief wound he had was in his thigh, where the muſcles were ſo ſtrangely cut at the heads of them, that he was in great danger of loſing the uſe of that member, the knee-pan having fallen down. Clowes ſewed the muſcles, and laid all cloſe and right; but becauſe he would not promiſe that the man ſhould walk perfectly, nor fix on a day by which he would be able to ride home, another ſurgeon was called, whom Clowes inveighs againſt, and deſcribes in the following terms: He was an idle bragging fellow, often out of breath in quoting authors to maintain his impoſſibilities. He cut out all my ſtitches, and laid the wound quite open, ſaying, that all wounds ſhould be healed open, and from the bottom. Thus was I condemned of inſufficiency, and cozened of my patient, and diſmiſſed thereupon." I do not mean by thus quoting a ſurgeon two hundred years old, to produce authority againſt authority, nor put his opinion in competition with that of Mr. Pibrac and the French Academy; I mean merely to ſhow you that ſuch deep ſtitching is an old practice; it was indeed for occaſions of this kind that ſurgeons invented and uſed the quilled ſuture. We cannot but allow that the ſewing of deep muſcular wounds, when done with diſcretion, is a good practice, unleſs we are to allow, of this bragging fellow's reaſoning, that wounds are to be healed open, and from the bottom. There are but two kinds of wounds which come under this deſcription of great muſcular wounds, either ſabre cuts acroſs the back and ſhoulders, acroſs the belly (but not penetrating) acroſs the breaſt, over the buttock, thigh, &c. or plunges of the point of the ſabre, ſword, or bayonet. In the firſt of theſe, viz. in broad ſabre wounds, as, for example, in a cut over the ſhoulders paſſing through

* The croſs ſtitch was a manner of holding the oppoſite ſurfaces of an amputated ſtump in contact; it was made with a great needle, like a ſeton needle, with a ligature generally of a pretty broad tape or knitting. It was paſſed acroſs the face of the ſtump in two oppoſite directions, the one tape croſſing the other in the centre of the ſtump, whence it was called the croſs ſtitch. See the Chapter on AMPUTATION.

the rhomboid and Latiſſimus Dorſi muſcles, down to the ſcapula and ribs, if you allow the wound to ſuppurate and heal with an interſtice, you will find the ſcar ſink very deep betwixt the two edges of the cut muſcle. You will perceive that there is a loſs of ſubſtance, and, of courſe, a loſs of ſtrength, which, not in this caſe indeed, but in others, may be of great conſequence; as, for example, where the bellies of the muſcles of the fore arm are cut acroſs, where the bellies of the gaſtrocnæmii are divided, or in the very caſe juſt mentioned, where the muſcles which extend the thigh are cut acroſs near the knee-pan. Now obſerve, that where you ſew ſo great a wound as this, it is not with the expectation of the parts abſolutely adhering, but if you keep the muſcles forward, up to one another, and nearly in contact for twenty-four hours, or a little more, though they do not adhere, they inflame, they are thickened, the whole fleſh in the vicinity of the wound is ſwelled; the blood and lymph are extravaſated, the muſcles adhere, as it were, to the parts under them; and though they do not unite with each other, they cannot retract. By this alone a great advantage is gained, for if you allow the muſcles to retract while they are hot, bleeding, and moveable, and let them continue retracted till the wound is ſtiff and inflamed, they become fixed in that poſition; and even the moſt profuſe ſuppuration will not looſen them again; they muſt heal with a gap; and beſides ſuffering from loſs of ſubſtance, they are apt to become uſeleſs, by being fixed and knotted in with the ſkin and with the parts beneath. Theſe are reaſons for ſewing every muſcular wound; as for Mr. Pibrac's fear of the deep ſtitches cauſing inflammation, ſurely at the worſt we have but to do as Mr. Pibrac did, "cut them out."

8th, If then the muſcular wound be broad, you muſt ſew it with ſuch ſtitches as its ſize, and the maſs of parts you have to ſupport may require, trying alſo to help theſe ſtitches, and relieve the ſtrain of the parts by plaſter, compreſs and bandage. If the wound be deep and wide, but without any great veſſel wounded, if there be no extravaſated blood, nor any thing particular to hinder the adheſion at the bottom of the wound, you may venture to put in one or two ſtitches, hoping, that if the wound adhere in the lips, it may adhere alſo within; you may alſo reſt aſſured, that if it do not adhere at the bottom, the adheſion nearer the mouth of the wound will not make great progreſs, and can do little harm. If the wound be exceedingly deep, as that made by the ſtab of a ſword, or of a pike or bayonet, you muſt not think of ſtitching it, for the mouth of ſuch a wound bears a very ſmall proportion to the wound; you have no command or

the wound by any ſtitch with which you can ſtitch the lips of it; this is a wound fit rather for the proceſs of the ſecret dreſſing; you ſqueeze it, waſh it, ſuck it if you will, and you truſt entirely to the compreſs: You put a compreſs upon the mouth of the wound, and if the blade have paſſed ſlanting along, you muſt lay a long compreſs, wherever you think it can have any command of the wound, ſo as to put its ſides in contact with each other. Gentle preſſure is peculiarly uſeful. This is the proper caſe for uſing the uniting bandage *.

## RULES FOR THE REUNION OF COMPLICATED WOUNDS, WHERE THERE ARE WOUNDED ARTERIES OR FRACTURED BONES.

This principle of adheſion pervades all ſurgery, and is to guide us not merely in ſimple wounds, as cuts of the face or head, or lacerations of the ſcalp, but alſo in complicated wounds; and I tell you further, I have been at this pains in explaining adheſion, becauſe it is the great practical doctrine in ſurgery, as inflammation is the chief ſurgical diſeaſe; and you are to keep adheſion always in your thoughts, both in ſimple and in complicated wounds, not in the firſt moment only, but throughout the whole cure: you are to have this doctrine of adheſion in view, even where you are ſenſible that it cannot entirely ſucceed.

By complicated wounds, I mean thoſe where the arteries are wounded, the joints opened, or the bones cut and broken, and protruding out of the wounds.

9th, In cuts of the wriſt, where the radial artery is wounded, or in cuts near the bend of the arm, where many great blood veſſels are concerned, or in wounds of the neck, or of the ham, or in the fleſhy parts of the thigh, we are often too much occupied with the bleeding, and with the important buſineſs of ſecuring our patient from immediate danger, to think of the means of procuring adheſion and a ſpeedy cure. But this is allowing ourſelves to be diſtracted by the hurry of an operation, a thing very unbecoming in a ſurgeon: We ſhould judge deliberately, and act coolly; we muſt be careful to perform both operations at once, both that by which the bleeding is ſuppreſſed, and that alſo by which the wound is to be reunited. Firſt, We let go the Tourniquet from time to time, or lift our fingers from the mouths of any veſſels that are bleeding ſmartly: we

* Vid. Chapter on Bandages, fig. 18. the uniting bandage is there repreſented as applied to the forehead, but it is a bandage more appropriated to the limbs or body.

tie each of theſe regularly with the needle, and when the arteries are tied, after the general oozing of the blood has alſo ſtopped, and the wound become dry, we perform the ſecond part of our operation, viz. uniting the wound itſelf. If it be on a hard and bony part like the wriſt, we lay the lips cloſe together, and perhaps put in one ſtitch through the ſkin to keep the lips cloſe. Generally in this kind of wound compreſſes well applied, and a neat roller, will keep it ſufficiently cloſe without ſtitching; but if the wound be in a fleſhy member, as in the thigh or arm, we often make two or three pretty cloſe ſtitches with the needle.

10th, Where conſiderable veſſels are wounded, we firſt apply the tourniquet, then tie the arteries; then undo the tourniquet to ſee that the arteries are really ſecured; then ſcrew the tourniquet again, that not even an oozing of blood may interrupt our next operation, viz. the cloſing of the wound; then ſew the wound according to its nature and ſize, leaving the ligatures of the arteries hanging from a corner of it; and though perhaps the whole will not adhere, yet much will adhere, and we always have our chance of procuring a total adheſion. The ligature keeps a little part open for itſelf, with a ſlight ſuppuration round about it, but attended with no pain, and it comes eaſily away the fourth or fifth day.

11th, When the bone is wounded, or cut, ſtill we purſue our great intention of uniting this complicated wound alſo, for the bone often adheres, and very probably the reunion proceeds after this manner. We put the bone into its place, and cover it with the ſkin, keeping all the parts in cloſe contact; the ſkin adheres to the ſkin; the bone itſelf moſt probably does not, in the ſtricteſt ſenſe, adhere to the bone, or at leaſt its adheſion is different in its period, and in its manner, from that of the ſoft parts. And yet the adheſion of the bone reſembles that of the ſkin, for the outward wound cloſes; the wounded bone throws out its mucus; that mucus becomes vaſcular; then bone is ſecreted; a kind of callus is formed for uniting the cut bone, and while this proceſs is going on within! The bone ſeems to have adhered at the very time of the adheſion of the ſoft parts. It is very particular, that in all fractures, great as well as ſmall, and, of courſe, in all wounds of the bones, the bone never heals till the outward wound is firſt healed up, ſo as to reſtore the continuity of the veſſels, which muſt be made perfect again, before the ſecretion of bony matter can begin. If a wounded piece of bone ſtill preſerves its connection with the ſoft parts entire, it adheres again, lives, and is reunited, and the general wound is made to adhere as firmly, having a cut bone in it, as if it were a ſimple wound! How otherwiſe

could we make the ſurfaces of an amputated ſtump adhere, it being the largeſt wound, having in its centre the largeſt cut bone? Therefore, when by a cut of the ſabre a bone is divided, when, for example, a man defending his head receives the wound in the fore arm, and has the Ulna cut clean through, or even when both the bones, both Radius and Ulna, are cut acroſs, ſo that the hand has fallen on one ſide; if but one of the great arteries of the fore arm remains entire, the hand may be ſaved; and in order to accompliſh this, the ulnar artery, if cut, muſt be tied, the bones ſet, by laying the fore arm on a firm ſplint; the wound itſelf muſt be ſewed with two or three ſtitches of the needle. The ſaving of ſuch an arm ſo cut acroſs in the middle of the bones, is much eaſier than when the wound is complicated with an opening into the joint. When a piece of ſcull is cut up with the ſabre, if you put it down again along with the flap of the ſkin, which it is ſtill attached to, you will find that the bone is ſo entirely nouriſhed by the pericranium, that it will continue to live, will adhere, and will reſume its connection with the ſcull, juſt as the flap of the ſcalp reſumes its connection with the ſoft parts. The proceſs of reunion is the ſame in a wounded arm.

The ſurgeon is apt to be alarmed beyond meaſure at ſeeing a member almoſt ſeparated; the thumb of a workman cut off by his tools, and hanging apparently by nothing but a piece of ſkin; the Tarſus cut almoſt acroſs by the ſtroke of the Adze or Axe; or the wriſt-joint cut open by the ſtroke of the Former or Chiſel, or almoſt cut off with a ſword, the hand hanging all on one ſide; or an ancle twiſted and almoſt torn away by machinery, the foot cut nearly away, hanging to one ſide, the joint opened, and the arteries bleeding. But in all ſuch caſes the ſurgeon muſt guard himſelf againſt the firſt impreſſion; he muſt never be in haſte to cut ſuch ſeparated parts away, becauſe in the hurry of the moment he is but an ill judge of the proportion of life and circulation which the part may retain; he cannot decide at once whether the part will or will not live; and the part, though ſeparated and dead, by being applied to the ſound and living parts, can do them no harm. He ſhould conſider always, that if he is to preſerve the part, it is by adheſion only, and he is to uſe all the common means of procuring adheſion. He is not (as I have too often ſeen done) to lay a limb thus mangled, and which he has ſome expectation of ſaving, in a great ſluſh of poultice. The proceſs for ſaving the hand of a workman, when thus mangled with his tools, is this; you are to take up the arteries firſt, then return the bones into the wound

if they project, ſtitch the ſkin over them, draw together all the open ſpaces wtih ſlips of adheſive plaſter, dreſs the outſide, not with an emollient fomentation, or a clumſy relaxing poultice, it muſt be moiſtened all over with camphorated ſpirits, by dipping pieces of lint in the ſpirits, and laying them along the wound. You are then to wind a roller gently round the part with moderate tightneſs, in order to keep all firm; and finally, if the joint, as the wriſt or ancle, be wounded, you are to lay the part out upon a ſplint *, as if it were a fractured limb.

12. The more complicated the caſe, the more anxiouſly ſhould we deſire to reunite the wound. We extend this principle even to COMPOUND FRACTURE, which is the worſt kind of wound; for in ſuch caſe the bones being protruded, the joint being burſt up, the capſule torn, and the heads of the bones being diſplaced and expoſed, if we merely return the bones into their place, we do little; the parts are ſtill ſo far ſeparate that they cannot adhere; they muſt inflame. It is not from the air getting into a joint ſo injured that we have pain, ſwelling, profuſe ſuppuration, and ſuch deſtruction of ſubſtance as endangers the limb; but it is becauſe the parts are ſuffered to remain ſeparate; for let me once more remark to you, ſuppuration muſt come on wherever parts are not joined. By ſewing a compound fracture, you will not always make the parts adhere; you cannot ex-

* "A man, in ſtepping out at a door where a ſervant was cleaving wood, put his foot upon the billet, juſt as he was about to redouble his ſtroke, and the axe went through foot and ſhoe and all, and the edge of the axe ſtuck deep in the wood; ſo that nothing remained undivided of the foot except the laſt bone of the tarſus, viz. that which ſupports the little toe. All the veſſels being cut, there was of courſe a great hæmorrhagy, and the man fainted, which happily ſtopped the bleeding.

The two parts of the foot were put together, and ſecured with compreſſes, ſplints, and a roller; and the man was ſo thoroughly cured, that when he wanted to ſatisfy his friends of this at any time, he could ſtamp with both feet very loudly, and ſo equally that you could not diſtinguiſh the ſound foot from that which had been divided acroſs."

La Motte, p. 310, tells of a French grenadier, who being out marauding, had catched one of the miniſter's hens, and the miniſter's ſervant, a good luſty fellow, came out upon him, and made him give up the hen. He laid the ſoldier down upon his back, and took his ſabre from him. After many earneſt prayers he returned it to him; and the moment the villain got it in his hand, he ſtruck at the lad's head, intending to cleave him. He defended himſelf with his arm; the ulna was quite divided, and part of the radius was cut. He threw the fellow down a ſecond time, and with his left hand alone would have chocked him, but was prevented. La Motte cured this man's arm. He cured alſo another, a dragoon, who, in fighting a duel with one of his comrades, had the ſhoulder bone cut almoſt entirely acroſs with the ſabre, a little above the elbow; and what remained of it undivided was ſplintered, but the artery was ſafe.

pect to cure it like a pure inciſion of the ſkin, nor like a wound of the axe or ſabre, which divides the bone or the joint with a clean cut, without deſtruction of parts! Aſſuredly, in proportion to the deſtruction of parts, and the violence of the bruiſe, your chance of reunion is leſſened! but even the ſmalleſt chance is not to be thrown away. You know, that when the ſcalp is torn by falling among ſtones, or by the wound of a bludgeon or of a ſtone, the parts are ſo injured that they muſt inflame, they cannot reunite immediately nor perfectly; the caſe reſembles, in ſome degree, a gunſhot wound; yet ſuch lacerations of the ſcalp very often are made to adhere partially; and at any rate, if the wound ſhould inflame after being ſewed, you have warning of the approaching danger, and can cut out your ſtitches in good time. So, in compound fractures! even in the wound or laceration of a joint! you are not merely to return the protruding bones; you muſt lay the lips of the wound, lacerated as they are, as fairly in contact with each other as may be; you muſt put a little dry lint over the wound itſelf, and lay ſoft rolled bolſters of lint upon it, ſo as to ſupport each of the ſwelled lips, and keep them cloſe; to your own diſcretion I muſt leave it to put in a ſtitch, or to refrain from it, according to the exigency of the caſe; but where there is the leaſt chance of eſcaping ſuppuration, and procuring reunion, I ſhould adviſe you to uſe the needle; for I have ſeen one or two ſtitches ſave the hand of a workman.

" A ſlater having fallen from the top of a houſe, four ſtories high, upon the pavement, had his life ſaved by lighting fortunately upon his right hand, which ſuſtained the whole force of the ſhock in ſuch a manner, that even his head had not touched the ground, and there was no other injury, except the luxation of one of his ribs from its cartilage. The wriſt joint was entirely torn; the radius, which of courſe received the chief part of the force (being the only bone that is properly connected with the bones of the carpus), was terribly ſhattered; the joint was burſt up with ſuch violence, that the hand hung quite on one ſide towards the radius, and turned as it were upon a point; the ſmall end of the ulna, with its ſtyloid proceſs, projected through the wound, and the hand looked as if ſpitted upon this bone; the hand was ſhortened by the manner in which the radius had yielded, for it was ſhattered and broken into ſmall fragments; and ſo violently was the hand diſtorted, that the head of the radius was turned out at the wound, though the wound was chiefly on the oppoſite edge of the fore-arm, viz. that next the little finger; along with the radius, one of the carpal bones projected through

the wound, quite ſeparated. I cut off the end of the radius with the cutting pincers of an amputation caſe; I dilated the wound with the knife; and I took up one of the arteries with the needle; I ſnipped away the carpal bone with the ſciſſors, for it hung only by a rag of tendon and ſkin. I turned the hand right upon the remaining part of the fractured radius, laid the palm of the hand and the flat inſide of the fore-arm upon a firm ſplint, made a ſtitch in the lacerated ſkin of the wriſt, to hold it together, and finiſhed by laying a large flat ſponge upon the open part of the wound, juſt a little moiſtened in ſpirits, ſo as to make it ſpongy, ſoft and pliant. This cloſed the laceration ſo ſmoothly, that almoſt the whole of the integuments adhered; the part which failed to adhere was of no great extent. The matter from it was in ſmall quantity and good. In three days it was plain that the hand was ſafe, and that there would be no gangrene. In about fifteen days the ſwelling had ſubſided, the ſuppuration had become very good, and the parts ſo cloſe, that it was likely the callus was beginning to form."

"This man was about three months under my care, but it was rather on account of the knotty ſwelling which ſurrounded the wriſt, and which was very hard to diſcuſs. But at the end of that time the callus of the radius was ſo firm, that he could uſe his hand pretty freely; and what was little to be expected, the joint alſo was reſtored. He recovered the rotation of the radius, as well as the bending motions of the wriſt; and now he finds his hand perfectly uſeful and ſtrong for work."

13th, There are certainly caſes where it were a folly to uſe the needle, eſpecially where parts are too much lacerated to lie equally together, too much bruiſed to eſcape ſuppuration. We cannot expect that all diſordered parts ſhould adhere, but yet a partial adheſion is often of much importance, and may ſave the part; and though we cannot with any degree of prudence uſe the needle, the regret of not being able to uſe it reſts upon our mind, we try to make up for this, by laying the parts ſmoothly together with ſoft ſponges, and little bundles of lint; we alſo apply ſlips of lint dipped in ſpirits; but no poultice, unleſs where we give up all hopes of ſaving the member by adheſion.

But there is one caſe, and perhaps only one, where adheſion is phyſically impoſſible, and that is the caſe of gunſhot wound, for there the parts are not merely hurt and lacerated, they are deſtroyed; they are ſo bruiſed by the ball that they are killed, totally deprived of life, and a partial gangrene, and a ſloughing of the mortified parts, muſt precede the cure of every gunſhot wound. It is only

after the ſloughing, and during the granulation of the wound, that the parts can adhere; and they adhere not at once, but ſlowly and ſucceſſively. Theſe peculiarities naturally forbid ſtitching a gunſhot wound, for that would but raiſe the inflammation higher, and increaſe the loſs of ſubſtance. But we have every motive, eſpecially where flaps of ſkin or muſcle are torn up by ſhot or ſplinters, to bring the parts cloſer and cloſer as the ſloughing proceeds, in order to give each point, as it reſumes its healthy action, a chance of renewing its connection with ſome adjoining parts; and thus there are certain caſes, where a judicious ſurgeon departing from the eſtabliſhed rule, will venture to put a ſtitch even in a gunſhot wound, drawing up the points, not ſo cloſe and firm as in other caſes, not with any expectation of the wound uniting by adheſion at thoſe points where it is ſewed, but with the deſign merely of ſupporting a flap, in order to preſerve it, and keep it nearly in that direction, in which he would like to have it to adhere, for it does adhere in the ſecond period of the cure, when the ſloughing is over, and the parts begin to reunite*.

14th, Even in wounds of the belly and breaſt, it is adheſion of the parts inwardly wounded which ſaves the patient. It is quiet, perfect ſilence and compoſure, and the natural powers, that bring about this adheſion. You lay the mouths of the wound gently and ſoftly together; you wait patiently the event of this natural proceſs; you can do little to aſſiſt, but you muſt do nothing to diſturb this proceſs. Many a patient died, in the times of the old ſurgery, by their thruſting tents into the wounds of the belly and breaſt; and even now we are too apt to diſturb and do harm by an unmeaning and too curious probing of ſuch wounds.

## OF CUTTING OUT THE STITCHES.

The laſt direction which I have to give you relates to the approach of inflammation and ſeparation of the wound, for I cannot allow myſelf to call it inflammation when the part adheres; this indeed were no better than to call a cure a diſeaſe.

* For examples of caſes where ſtitches may be uſeful in gunſhot wounds, look in the Chapter on Gunſhot Wounds for Caſes of Wounds of the Face and Throat.

The adhesive inflammation (for it is called inflammation), is not attended with fever, pain, swelling, nor redness, unless in the most trivial degree; that gentle swelling which indicates the fulness and strong but healthy action of the vessels an adhering part must have; but this increased action of the vessels during the reunion of the lips of a wound, stands on the same footing with the healthy action of vessels in forming, or in supporting any part of the system. A bone, for example, is formed and completed by the natural action and fulness of these arteries which are destined to produce it; a spoiled bone is regenerated by an increased action and fulness of the same vessels; the callus which reunites a broken bone is formed by a full but slow and regular action of these arteries which extend from each end of the broken bone, and meet each other; and whenever vessels, extending either from the ends of a broken bone, or from the edges of any wound in the soft parts, meet each other, the part is entire again; they form a perfect system of circulation; from the very first moment of adhesion the vessels of a wounded part resume their healthy action, unaccompanied with inflammation, swelling, or pain; the part is once more entire and sound. If the vessels become thus entire from the very moment of their reunion, if neither pain nor swelling come on, unless the process fail, how can this process be called a disease? Or, by what sophistry can it be comprehended under the definition of an inflamed part? To speak thus appears to me an incorrect and unfavourable view of the matter. It is to describe the cure by the very name of the only disease which can interrupt the cure. I must therefore consider the part as going on in a sound action, while it continues to adhere, and shall proceed in describing what is to be done, if the wound should begin to separate and open, or, in other terms, should begin to inflame.

Adhesion prevents inflammation: when the parts adhere they enter into a healthy action; they are entire, and they do not inflame. Whenever any part is not in contact, and does not adhere, it must inflame: if one point of a wound be left thus separate, its inflammation may extend to the adhering part of the wound, and so one point left thus separate endangers the whole. The stitches, if imprudently made, if drawn too tight, or made too frequent, or made with too coarse a ligature, are themselves a cause of inflammation; inflammation disposes the wound to burst open again, and so the inflammation around the pins or stitches endangers the whole; and sometimes the timely undoing of such stitches prevents this opening of the wound. If there be blood poured out under the

wounded part of the ſkin, it acts as a foreign body; it ſeparates the ſkin from the parts below, which is exactly equivalent to the ſeparation of the edges of the wound itſelf: this alſo endangers the whole. From all which you will conclude, firſt, that whatever prevents the perfect application of the wounded ſurfaces endangers inflammation. The moment you obſerve pain, inflammation, and ſwelling of the wound, a ſeparation or gaping of its lips, the ſtitches tenſe, and the points where the ſtitches paſs particularly inflamed, you ought to undo your bandages, draw out your pins, cut your ſtitches, and take away every thing that is like ſtricture upon the wound. Theſe prudent meaſures may abate the riſing inflammation, and prevent the total ſeparation of the ſkin, while you may ſtill endeavour to keep the wound tolerably cloſe, by the more gentle means of ſticking plaſters.

But ſhould the inflammation riſe ſtill higher, and ſhould you perceive that a total ſeparation and turning out of the wound is inevitable, you muſt throw all looſe, put a large ſoft poultice round the whole, and forſake, without heſitation, all hopes of procuring adheſion. Should you, in this critical juncture, perſiſt in keeping the parts together with ſutures, the inflammation would, in the form of eryſipelas, extend itſelf over the whole limb, attended with a fœtid and bloody ſuppuration, waſting the ſkin with great loſs of ſubſtance. Therefore throw all looſe, apply your poultice, allow the wound to ſeparate in its lips, and to paſs ſlowly into a ſoft and eaſy ſtate of ſuppuration; and then a ſecond time try to bring the edges up to one another, not by ſtitches, but by adheſive ſtraps, or by a gentle bandage.

## DESCRIPTION OF THOSE WOUNDS WHERE ADHESION IS NOT EASILY OBTAINED, AND OF THE ACCIDENTS BY WHICH ADHESION IS HINDERED.

I fear I cannot have recollected all the rules that may be needful for you; but if I have taught you the general principles truly, you will be able to add whatever may be wanting, and to accommodate the rules which I have delivered to the circumſtances of each particular caſe; and yet it is perhaps neceſſary to recapitulate and explain the various accidents which will prevent adheſion. A wound will not adhere where there is much loſs of ſubſtance, where it is difficultly drawn together, where the parts are put upon the ſtretch, where the edges

are not completely oppoſed to each other, where there is a neceſſity for many and deep ſtitches, firm ligatures, or a tight bandage; for in thoſe circumſtances the ſurfaces inflame; and whatever parts inflame cannot adhere, neither will the parts adhere when the wound is great, for that is of courſe equivalent to loſs of ſubſtance. Thus I remember to have ſeen a ſtump more cruelly ſewed than even by the croſs ſtitch of Paræus; it was ſewed with ſeven great hare-lip pins made on purpoſe; and though the lips of the ſtump were eaſily brought into contact, the ſtump, from this cruel operation, fell into total mortification on the third day.

When the wound is deep, it does not always adhere; ſtitches do not go to the bottom; the deeper parts remain full of blood, and unoppoſed to each other; the ſewing up the mouth merely of ſuch a wound muſt do more harm than good. A gunſhot wound cannot adhere, both becauſe the deadening of the parts is equivalent to loſs of ſubſtance, and becauſe, until the ſloughing be over, the dead parts within the wound prevent the contact of thoſe which are alive. If ſtitches are imprudently uſed in a gunſhot wound, and drawn tight with the intention of procuring adheſion, they muſt burſt out, becauſe a gunſhot wound ſwells on the fourth or fifth day as a prelude to the throwing off the ſloughs. A foreign body lodged in a wound, generally prevents adheſion; for though the foreign body be far down at the very bottom of a deep wound, it inflames the extremity of the wound, and that inflammation extends along the whole tube; wounds heal ſometimes over balls and other foreign bodies, but they heal very ſlowly and imperfectly. If there be an effuſion of blood into the cavity of a wound, that ſtill more certainly prevents adheſion, both as it keeps the parts ſeparate from each other, and as it acts like a foreign body, in diſtending, irritating, and inflaming the wound. But the circumſtance of the ſurface being kept in any degree ſeparate, is, of itſelf, a ſufficient cauſe of a wound not adhering; for parts kept ſeparate muſt inflame; when they inflame they cannot unite; and therefore, a ragged and lacerated wound, the wound made by the cruſhing of great ſtones, of mill-wheels, or other machinery, the bite of a horſe, dog, or other animal, cannot eaſily adhere, becauſe, from the irregular laceration, no one ſurface correſponds with another; and ſince the ſurfaces cannot be put in nice contact, point to point they muſt inflame, cannot adhere, and muſt fall into ſuppuration. Often the inflammation of a bite excites terrible apprehenſions leſt it ſhould prove to be the bite of a mad animal, though in

ninety-nine of an hundred caſes it is from the laceration, from the irregularity of the wound merely that it will not adhere.

The manner alſo of uniting a wound may be ſo faulty as to cauſe inflammation; for if it be left ſtill bleeding at the time it is ſtitched, if a piece of bone, looſe and quite detached, be left in the wound, if part of the ſkin be turned inwards when it is ſewed, if the ſtitches be too frequent, as in the continued ſuture of the ancients, or drawn too hard, as in what they called the reſtrictive ſuture, for reſtraining the blood; if the ſuture do not gently ſupport the lips, but bear upon them with a painful ſtraining; then the ſtitches themſelves are as foreign bodies; the inflammation appears chiefly where the ſtitches are; and if to theſe faults be added that of binding a roller too tight round the part, the whole member ſwells the firſt day, the ſtitches are inflamed the ſecond day, and if they be not ſlackened, or altogether cut out, they burſt on the third, and the lips turn out, the wound opens, an eryſipelatous inflammation comes on, the parts ſuppurates with great retraction and waſte of ſubſtance, and it is fifteen or twenty days before we can make another attempt to cloſe the wound, by bringing up the lips of it gently with compreſſes and bandage.

But the worſt caſe of all is, when ſtitches are imprudently made after a wound has already become inflamed; for that is juſt like the imprudence of cutting off a limb after a gangrene is begun. We may cut off a limb to prevent gangrene; but if the gangrene be already begun, and we cut off a limb, the gangrene, far from being interrupted, will rather be hurried on to its fatal termination. In like manner, we may uſe ſtitches in order to prevent inflammation, by reuniting a wound; but if the wound be already inflamed, and the time for prevention be paſt, then ſtitches, as they cannot unite an inflamed wound, will hurry on the inflammation to its greateſt violence. For I muſt venture once more to obſerve to you, that ſtitches are meant to prevent inflammation, not to cure it; that ſtitches made while the wound is ſtill freſh reunite the veſſels, which, being joined again, ſoon fall into a calm and healthy action; but if inflammation be once begun, it will not ceaſe. Stitches put into a ſound part prevent inflammation; but if driven through an inflamed wound, they increaſe the diſeaſe, and may bring it into a ſtate of gangrene.

An unhealthy conſtitution is unfavourable to the healing of wounds; but under this head I do by no means comprehend a ſcrophulous habit of body; for in ſuch habits there ſeems to be a lively action in the ſkin, accompanying its

lively complexion, which diſpoſes it to heal very quickly; ſo that although, from the ſlow ſuppurations of ſcrophulous glands we ſhould apprehend, that in any ſuch conſtitution an accidental wound ſhould be very difficult to heal; we yet find by experience, that a clean cut in a ſcrophulous perſon heals with peculiar eaſe. The unhealthy conſtitution which I mean, is that which is marked by weakneſs; and it is very ſtrange, that men ſhould continue to argue and to practiſe as if inflammation aroſe always from high excitement, and from that alone; he muſt have obſerved little who is not ſatisfied, that it ariſes, in by far the greater number of caſes, from a very oppoſite cauſe. It is in unhealthy and weakly conſtitutions that wounds refuſe to unite; and they burſt out the inſtant that any cauſe of ſudden weakneſs affects the general habit. If a man be ſcorbutic, ſyphilitic, or feveriſh, ill fed, ill clothed, expoſed to cold and moiſture; if he be laid in a foul hoſpital, priſon-ſhip, or jail; if he be a priſoner when wounded, depreſſed in ſpirit, weakened in body, exhauſted with fatiguing marches, confined with many of his fellows in ſome damp and noiſome priſon; if he have lived long in an unhealthy camp, or in a hot climate, any wounds he may have will not unite: or if his wounds have been well and neatly united, and have begun to adhere (but have yet adhered imperfectly), they inflame and burſt out again the moment that theſe circumſtances affect his general health: no ſooner is he ſeized with purging, dyſentery, fever, or the fits of an old intermittent, than his wounds open afreſh. It is debility that cauſes this inflammation and burſting of wounds; it is debility, either habitual, or ſuddenly produced, which converts wounds into malignant ſores; and as ſcurvy, when it makes its ſlow progreſs in the ſyſtem, ulcerates the gums, opens old wounds, and even diſſolves the callus of fractured bones; in like manner does any cauſe of ſudden debility affect a wound, and make it ſwell, inflame, and burſt its ſutures.

This reminds me of telling you, in the laſt place, how important it is to procure adheſion, in the very firſt moment of a wound; for the longer this is neglected, the leſs is the part diſpoſed to heal. A ſpeedy adheſion ſaves pain and inflammation, prevents ſuppuration, waſting of fleſh, a wide ſcar, and all the other deformities and diſtreſſes of an ulcerating wound. It prevents more ſerious ill conſequences than pain and deformity; it prevents that burſting of arteries which is ſo apt to happen in an ulcerating ſore, or that oozing of blood which is ſo much more difficult to command than the moſt impetuous burſting of ſound arteries, and which is always an omen of ſomething ſtill worſe approach-

ing. The ſpeedy adheſion of a wound prevents ſleepleſs nights, diarrhœas, fever, and waſting of the fleſh, and the acceſſion of the hoſpital fever, or hoſpital ſore. You do not know, after a battle, how ſoon your patient may be thrown into ſome foul hoſpital! nay, even in a ſtationary and well regulated hoſpital, your patient may be ſeized with hoſpital fever, dyſentery, or ſome other diſeaſe. If you once get the adheſion thoroughly accompliſhed before any ſuch misfortune happen, your patient is, in ſome degree, ſafe; if you neglect the firſt moment of healing his ſore by adheſion, it may never heal; if he lie but a few days in a foul hoſpital with an open wound, that wound becomes a ſore; the ſore is followed with diarrhœa, foul tongue, nauſea, and thirſt; he becomes ſickly; the ſore degenerates, he falls into a fever, and dies; his ſafety, his life, turns often upon this ſingle point, of procuring a ſpeedy adheſion.

Thus, Gentlemen, have I laid before you a ſhort hiſtory of the rude and cruel practices of the older ſurgery, and the firſt dawnings of this doctrine of adheſion; its general importance in our profeſſion, and its final application to wounds and operations: by it we perform cures more ſudden and wonderful, than thoſe which were of old achieved by the ſecret dreſſings and ſympathetic powders. Theſe which I have laid before you are the CANONS of MODERN SURGERY, which ſtand in place of thoſe rules which inculcated the Mundifying, Incarning, and Cicatrizing of wounds.

TBell del *the* BOY SAUNDERS *Explained P.58*

# DISCOURSE III.

## OF ILL CONDITIONED AND COMPLICATED WOUNDS; OF ULCERS, DRESSINGS, BANDAGES, AND THE DAILY DUTIES OF AN HOSPITAL SURGEON.

THE ſuppreſſing hæmorrhagy in all dangerous wounds, or the providing for adheſion, is the firſt great buſineſs of the ſurgeon; but the preſerving the health during a tedious cure, the alleviating pain, the preventing ſuppurations, the procuring the reunion of broken bones, the healing of fiſtulas, and the curing ulcerated, ill-conditioned wounds, are his daily duties: they are important duties; and if I be not greatly deceived, require more induſtry, good ſenſe, and profeſſional knowledge, than is uſually imagined.

The curing ill-conditioned wounds is a wide and important department of ſurgery; for under this claſs we muſt reckon almoſt all wounds which do not immediately adhere; all complicated wounds; all thoſe where the blood has been driven inwards among the muſcles, where the great arteries are injured, where there is much ſearching and cutting up of the member, before the bleeding arteries are found; where arteries burſt out from time to time, injecting the parts with blood; where the joints are injured, the bones much broken, or where, though the bones are not broken, the fleſh which lies deepeſt has been ſorely bruiſed againſt the bones, ſo as to fall into inward ſuppuration, accompanied with great ſwelling of the limb.

Gunſhot wounds, even in the leaſt dangerous places, though merely in the fleſh, are alſo to be reckoned among complicated wounds; they cannot adhere, both as being gunſhot wounds which are unavoidably attended with a partial mortification and deſtruction of parts; and as balls or other foreign bodies are often lodged deep in the fleſh. In ſuch caſes the wound, though it cannot heal, yet tends to heal, by which its tube becomes firm, ſolid, and callous, it pours out a thin ill digeſted matter, and ſo degenerates into a fiſtulous ſore.

I have thus deſcribed ſlightly a claſs of wounds, which it were difficult or impoſſible to define: the term, Complicated, Ulcerated, or Fiſtulous Wound, comprehends an infinite variety. Yet it is of ſingular importance to you, that I ſhould, in the opening of this diſcourſe, lay before you, unequivocally and plainly, the nature of that caſe which I am about to explain; I am now to explain to you, not any one individual wound, but the various diſorders of a ſwollen ill-conditioned limb. I am to ſuppoſe you entered into the wards of an hoſpital, looking around you upon limbs variouſly wounded, but all of them lying out, ſwollen, ſuppurating, fiſtulous, rotting in their own filth, having carious bones, bleeding arteries, and a profuſion of matter, the patient exhauſted in the mean while with diarrhœa, fever, and pain.

If all the ill-wounded limbs in an hoſpital fall into this condition, the diſeaſe may almoſt be conſidered as one particular caſe; and I ſhall now endeavour to explain to you how much of this diſorder is to be aſcribed to the unſkilfulneſs of the ſurgeon, and what part of it ariſes from the eſſential nature of the wound. I will endeavour to inſtruct you in all the daily duties of an hoſpital, and thoſe are always the moſt eſſential duties. I will ſuppoſe you, as young ſurgeons, intruſted with a moſt important charge; going your rounds through your department of the hoſpital; obſerving the condition of each wounded limb, and trying to diſcover what particularly can be done for each; and followed by the nurſes, mates, and ſervants, with all the neceſſary apparatus of ſponges, towels, rollers, injections, and ointments, ſetons to draw through the cavities of fiſtulous ſores, and cauſtics to touch their callous mouths.

If a wound be open, ſuperficial, large and wide; if it be a lacerated wound, ſuch as cannot be reunited; or if it have been ſtitched, but without ſucceſs, ſwelling and inflammation comes on with intenſe pain and fever; ſuppuration enſues; the wound degenerates into an open ſore; but is rarely accompanied with intenſe ſwelling, or any general diſorder of the limb.

If a wound be deep and narrow, paſſing down into the muſcular parts; if it be made by muſket-ſhot, and eſpecially if the ſhot be lodged among the deeper parts! the whole limb inflames, ſwells, and falls into a general ſuppuration; and from this critical moment in which it ſuppurates, every thing depends upon the ſkilfulneſs of the ſurgeon. A limb ſo wounded, being committed to the care of nurſes only, or of ignorant young men, muſt go wrong; the matter collecting, works its way forwards unobſerved, till at laſt the cellular ſubſtance is

entirely deſtroyed, the muſcles undermined, the bones inſulated, ſurrounded with matter, and thoroughly ſpoiled and carious. The fleſh, ſkin, and cellular ſubſtance of ſuch a limb, are all macerated and ſoftened, the joints are ſwelled and ſpongy, the whole limb lies a ſhapeleſs maſs of ſuppuration; it is irrecoverably diſeaſed; it is inflamed, fiſtulous, verging towards gangrene, or ſoaking in ſuppuration; the health and ſtrength decline rapidly; thence comes on the queſtion of amputation; and that limb which might ſo eaſily have been ſaved, is in danger of being cut off.

When a limb is perforated with balls, or battered with great ſhot, or cruſhed in machinery, ſo that its bones are broken, perhaps protruded, its great arteries wounded, and all its fleſhy parts, all its deeper muſcles, bruiſed inwardly againſt the bones; it often falls into gangrene on the firſt days; or (if the patient eſcapes the firſt danger), into univerſal diſeaſe: the whole limb ſwells to that enormous degree which threatens gangrene; ſome parts are very highly inflamed, others ſlightly gangrenous; the cellular ſubſtance, and the interſtices of the muſcles, are filled with extravaſated blood; and in conſequence of this extravaſation of blood, the ſuppuration is dark coloured, fœtid, and very foul; the ſkin is much deſtroyed, the openings numerous and fiſtulous, the bones carious, the fleſhy or muſcular parts of the limb waſted: theſe are inevitable dangers ariſing, not from the careleſſneſs of the ſurgeon, but from the eſſential nature of the wound. Thus would I repreſent to you the various forms of a complicated wound; the diſeaſes which enſue are among the moſt important in ſurgery, and, at the ſame time, the moſt neglected; ſurely, if any ſkill or conduct can ſave a limb from falling into this condition, that conduct, and the knowledge which it implies, muſt form a very ſerious part of the duties and learning of a ſurgeon.

Let us, firſt, then, conſider the way in which the moſt ſimple wound may degenerate thus. When the adheſion fails, the wound inflames, and all the means which have been uſed for uniting the wound, ſerve but to make it open ſo much the more; you undo your bandages, take off the adheſive plaſters, and cut out your ſtitches; "You throw all looſe, allow the lips of the wound to ſeparate from each other, and fall into a ſoft and eaſy ſtate of ſuppuration, and lay the limb in a large emollient poultice." But when the young ſurgeon extends this good rule, to the ſuppurating or ſecond ſtage of ſuch a wound, he miſtakes the intention, and offends againſt reaſon and common ſenſe; the ſuppuration is itſelf a diſeaſe

which he ſhould yield to only for a moment; for no ſooner is the ſuppuration eſtabliſhed, and the ſtate of the wound determined, no ſooner does the firſt inflammation ſubſide, than the wound falls next into a ſtate of relaxation and weakneſs. The violent action of the veſſels has ceaſed, the danger of gangrene is paſt, and there is eſtabliſhed a new diſeaſe! it is now a low inflammation and profuſe ſuppuration which you have to combat; and the ſwellings of the limb, collections of matter, frequent ſuppurations, ſpoilings of the bones, and deſtruction of texture among the ſoft parts ſucceed each other, ſtep by ſtep, till the limb, if it be not well attended to, falls into irrecoverable diſeaſe. This cannot be the diſeaſe which is uſually named inflammation. This ſtate of a wound cannot require poultices, fomentations, leeches, and a low regimen; it proceeds merely from relaxation, and requires quite an oppoſite cure. The patient after the loſs of blood, the pain and diſorder proceeding from a great wound, has lain continually in bed, and during fifteen or twenty days has enjoyed no reſt, has loſt his appetite, has waſted in ſtrength, and declined in health, and his limb has been ſteeped all the while in hot and ſour poultices. He has now a degree of fever, a diarrhœa, a furred tongue, a low and weak pulſe; and as for the limb itſelf, it is turgid and ſwelled from the trunk of the body downwards; it retains the impreſſion of the finger like a dropſical limb; it is ſpongy and colourleſs everywhere but at the wound; and even the wound itſelf, which is ſuppoſed to be inflamed, has nothing of a lively inflammation, but, on the contrary, is duſky and livid, with flabby lips, and a foul and gleetty diſcharge. Theſe are marks of nothing but relaxation, ſuch as will be perpetuated, if the ſame ways of treatment be continued. In one ſenſe, indeed, I agree with thoſe who think that a poultice will promote ſuppuration, or force it, for I think that fomentations, poultices, greaſy applications, a total want of ſupport, and the filth of its own matter accumulated about it, will keep a ſuppurating wound for ever in a ſtate of ſuppuration. Yet theſe errors are now ſo common, that they are regarded rather as the regular routine of practice; and a ſurgeon is not blamed who, viſiting ſuch a leg every day, ſees it ſwelling more and more, and growing daily worſe and worſe, orders it to be wrapped up again in its poultice; and aſcribes the ſwelling, and profuſion of matter, merely to the inevitable conſequences of the wound.

I muſt truly confeſs, that while we are improved in all the great and difficult points of ſurgery; we are gone backwards in all the nice and delicate attentions, which are ſo neceſſary in the cure of wounds. When barbers af-

fected the character of ſurgeons, ſurgeons were forced to imitate their methods of careful niceneſs in dreſſing, and became their rivals even in their own peculiar trade of dreſſing ſores; but it ſeems as if now that ſurgery has riſen to its proper rank; ſurgeons were even at pains to depart as far as poſſible from the frippery of this manner, by which many uſeful methods have been loſt, and the practice of common ſurgery become ſlovenly to a ſhameful degree. Long ago a ſurgeon could never do too much in the way of probing and ſearching wounds, tenting them to the quick, injecting them with balſams, and torturing the limb with injudicious bandages: but now a ſurgeon thinks he has done enough in clapping a plaſter over a ſore with the palm of his hand, or with clean hands he feels the pulſe for forms ſake, and orders the limb, without regard to its condition, to be laid in a maſh of poultice.

This relaxing poultice, which is ſo eaſily preſcribed, and ſo indiſcriminately uſed, is good only in the firſt days of a highly inflamed wound, where there can be no hope of curing by adheſion: it is to be uſed in all wounds where, having tried to procure adheſion, we find that it will not ſucceed; where the ſtitches are burſting, the wound inflamed, the lips ſwelling, and the parts ready to fall into ſuppuration; where, in plain terms, our alternative is ſuppuration or gangrene! where forcing and ſtraining the wound with ſtitches and bandage would produce gangrene; where we are glad, through neceſſity, not choice, to throw it looſe, and wrap it in poultice, in order to procure ſuppuration.—In a part ſo lacerated by a bite, by machinery, by falls, that it cannot adhere, or, at leaſt, muſt be eſtabliſhed in ſuppuration before it can adhere, poultice is needful.—It is proper alſo in thoſe great wounds, where men being buried in mines, the flaps of ſkin which are torn down are choked and mixed, as it were, with coal-ſlack, or earth; or where a man having fallen among ſand, or rough ſtones, the flaps which are torn down from the ſcalp or other part, are filled with earth or mud: in all ſuch caſes poultice ſhould be firſt applied; and when the parts are thoroughly cleanſed by ſuppuration, the flaps may be replaced, and then ſtitches will ſucceed.—When a limb has been battered by ſhot, or machinery, or the fall of buildings or mines, ſo that the bones are broken, the joints cruſhed, the limb irrecoverably deſtroyed; if the ſurgeon has come too late to perform amputation, if he is fearful of gangrene, and is waiting for ſuppuration, there is no better application than fomentations or poultice.—In the firſt ſtage of gunſhot wounds, eſpecially where bones are broken, fomentations or poultices may be uſed; but when the ſloughing is over, and the limb falls into a relaxed condition,

we change our plan of cure.—Even in the caſe of common abſceſs, though we know of no application ſo ſoft and pleaſant, ſo effectual in relaxing the ſkin, and promoting a ſuppuration, as poultice, yet the ſuppuration being perfect, and the abſceſs burſt, the continuing this poultice (as is but too often done) relaxes the parts, and increaſes the ſuppuration. Even in this caſe, the faireſt of all for uſing poultice, we uſe it but for a time, and for a purpoſe *.

But when we come to a neglected limb, lying in a ſluſh of matter and foul poultice, we plainly perceive, that this lax ſwelling, this profuſion of matter, and even the attending diarrhœa, nauſea, and fever, which ſurgeons complain of, proceeds merely from their own negligence and ill practice. This relaxing poultice is ſuffered to be renewed daily, or to lie without being renewed! under the pretext of the wound being a ſuppurating one; a fomentation perhaps is ordered, with hopes of ſtimulating the flabby parts to ſome degree of action, but ſo careleſsly is this fomentation applied, that the joint or the limb receives more cold than warmth, and the bed is ſoaked with it! for half an hour of warmth and comfort, the patient ſuffers permanent cold, filth and moiſture: and how much harm is done in hoſpitals by theſe two applications, it is impoſſible to expreſs. This condition of the patient is itſelf a great part of the diſeaſe; under this careleſs treatment the limb grows every day more and more turgid, the ſuppuration continues to increaſe, the fleſh becomes pale, the wound flabby, livid, and indiſpoſed to heal; the alteration which a ſenſible change of practice brings about upon a limb ſo neglected, is very ſudden and pleaſing.

We remove the poultice, and lay a piece of dry lint into the wound; we uſe a ſtimulant fomentation, made of a ſtrong decoction of camomile flowers, with ſal-ammoniac and ſpirits, to cleanſe and excite the ſkin; we dry the limb thoroughly, wrap it up in warm flannel, and remove the foul and moiſt clothes; we dreſs the wound the next day with ſlips of plaſter, that the dreſſings may come eaſily off, and with ſoft and fine lint fill up the baſin of the ſore, laying a flat ſponge above the lint to abſorb the matter of the wound. The patient, in place of ſoaking his

* I am ſure I ſee poultice uſed every day, not "for a purpoſe, nor for a time," but from careleſs habits, and from not obſerving how ſoon ſuch applications ruin the texture of a limb. I know of no author, except Belloſte; who has rightly obſerved this, though the practice has now got to ſuch a height, that any man may venture to reprove it, without intrenching himſelf in authorities. Belloſte ſays, p. 214, "That fomentations contribute much to the protracting of the cure. 'Tis very ſure, that theſe parts drink up the moiſture, which ſoftens, relaxes, and puffs up the ſkin, and, paſſing through it, fills the parts like ſponges; the natural heat of the part is thereby ſuffocated and extinguiſhed, no perfect concoction can take place but all is turned to matter and corruption."

limb with a fomentation or poultice, rub in with his own hand ſome ointment or balſam ſuited to the condition of the wound. If at certain dependent points, or if round a joint, ſuppuration is threatened, let him rub in a ſoft ointment of marſh-mallows, or palm oil; if he is tortured with pain, let him rub the part with laudanum and camphor; if the parts are to be ſtimulated to a more healthy action, let him rub and ſtroke the limb with his own warm hand, uſing camphorated oil, ſpirits and ſoap, anodyne balſam, or any ſtimulant embrocation; let the lips of the wound be ſupported with ſoft pledgets of lint, and the whole limb be rolled carefully from the toes upwards, by which the general ſwelling of the limb will be diſſipated, and the healthful action ſupported, the tumour will be repreſſed, except at the place of the wound itſelf, the wound will look florid and healthy, and the patient will be eaſy, his ſleep will return, his diarrhœa will ſtop, and his appetite will be reſtored.

But if, to the ill condition of ſome great wound, there be added a general injury of a limb, the caſe becomes very complicated and difficult, compared with this mere relaxation of the limb, or bad condition of any ſingle wound; for when the wound is deep, and the opening narrow, the bones broken, or the fleſh bruiſed againſt the bones, there are various internal parts hurt which ſucceſſively fall into diſeaſe, with great diſorder of the whole member. Then the limb ſwells, with great danger of gangrene, if it eſcapes the preſent danger (which is over in a few days), then irregular ſuppurations enſue, ſucceſſive abſceſſes form; the ſkin ſwelled up by matter, and, inſulated from the parts below, burſts, waſtes with ſuppuration, is perforated with many openings, and at laſt ſloughs and is entirely deſtroyed. The cellular ſubſtance, which connects the muſcles with the ſkin and with each other, is the chief ſeat of ſuppuration; and the cellular ſubſtance being diſeaſed, the muſcular fleſh of courſe ſuffers, falls into ſuppuration, waſtes during the inflammation, and the abſceſs is cured only after great loſs of ſubſtance, and ſuch a knotting together of what remains of the macerated fleſh and diſeaſed ſkin, that the uſe of the limb is loſt; it remains lame, diſfigured, ſhrunk and rigid.

If the ſuppuration ſurrounds a joint, there the matter cannot penetrate deep, for the capſule, faſciæ, and all the leſs ſenſible membranes which ſurround a joint, reſiſt the ſuppuration, but the matter works round the joint, with great pain, miſery, and hectic fever; the ſkin is thickened and puffed up, is perforated by the matter; the whole ball of the joint, as of the ſhoulder or knee, is maſſed by inflam-

mation into one confuſed knot of thickened ſkin and ligament, while deep abſceſſes and fiſtulous openings ſurround the joint in every direction. If the life be ſaved in ſuch a caſe without amputation, at leaſt, the uſe of the joint itſelf will be loſt.

But if the inflammation go ſtill deeper, and the matter work itſelf downwards among the muſcles, and eſpecially if ſome broken pieces of bone lead the ſuppuration inwards, the bones themſelves are inflamed, carious pieces of bone are thrown out from time to time, with ſucceſſive ſuppurations, and great pain, and the limb becomes thoroughly diſeaſed to the very centre. To the diſgrace of our profeſſion, books are full of nothing but bloody operations! yet, what merit is there in performing trepan or amputation, compared with that of curing ſuch a limb?

In the firſt ſtage, and while abſceſs is forming in the limb, you will watch it with inceſſant care; for an abſceſs which might be eaſily cured, often, by being neglected, goes down to the bone. At each dreſſing you feel carefully all parts of the limb; you allow no complaint of pain, no appearance of redneſs, no feeling of ſoftneſs, to paſs unobſerved. In a diſeaſe like this, an abſceſs does not project from the ſurface like a boil, but works downwards among the interſtices of the muſcles, long before the part becomes red. This is an abſceſs forming in the midſt of a great maſs of thickening and diſeaſe; the abſceſs is often the flatteſt part of the limb; and when you feel one part ſinking below the level, and the integuments becoming thin; when your fingers ſink into a ſoftiſh hollow, which feels empty, with a hard and knotty border ſurrounding it, you may be aſſured the abſceſs is formed. Then you muſt open it, leſt the matter ſink deeper among the parts; you never make a large opening, nor cut up the ſkin, but uſe, in place of the broad ſhouldered abſceſs lancet, a ſmall bleeding lancet. Strike deep; open the abſceſs thoroughly, but with an opening ſo ſmall, that you need preſs out the matter diligently every day. You will ſoon diſcover whether your opening be central, and whether the exit be free; you introduce your probe, and feel whether there be any undermining of the neighbouring parts, any obliquity of the abſceſs, or whether the abſceſs be of ſuch extent that a counter opening is required; you ſqueeze out the matter gently, but with perſeverance; and having emptied the abſceſs, you take advantage of its ſides being put together, and endeavour to reunite them; you fit your compreſs to the ſhape of the hollow, you make it of ſoft rolled lint, ſometimes you lay on the lint in handfuls; you roll the part carefully, and with ſuch a degree of firmneſs, as keeps the

ſides of the abſceſs in contact: though you may not procure adheſion at the firſt, you reduce the ſize of the cavity, leſſen the quantity of matter in a remarkable degree, and in the courſe of time, you find the parts grow firm, and the ſides of the cavity adhere.

By this prudent and careful proceeding, you gain every object; you ſave the ſkin from being further deſtroyed, and the parts within from being further drawn into diſeaſe: but if you neglect this opening, the muſcles, or even the bones, ſuffer; if you open the part with an inciſion, eſpecially in an hoſpital, the infection comes upon the ſore, and the patient dies; if you open it, and then neglect it, the openings grow fiſtulous, and new abſceſſes are formed. By opening the wriſt joint, in a caſe of gunſhot wound, with a ſmall bleeding lancet, in three points, with theſe precautions, I have ſaved the joint; whereas the ſlighteſt inciſions, in the ſame wards of the hoſpital where this man lay, burſt out into frightful ſores. The older ſurgeons well knew the art of managing ſuppurations by a bandage, an art too little ſtudied, or rather too little cared for by the modern ſurgeon; he orders his poultice, on all occaſions! but they were careful to accommodate their compreſſes to the form of the abſceſs, and to alter their place as the matter changed its ſituation. When they rolled their bandage in ſuch a manner as to prevent matter ſinking into ſome hollow, where it might work downwards among looſe cellular ſubſtance, they called their bandage FASCIA APOSTHEMA PROHIBENS; when they puſhed the matter before the compreſs towards ſome point which they judged ſafe, they called their bandage FASCIA APOSTHEMA FACIENS; and they called it FASCIA UNIENS when they obliterated a cavity, by procuring adheſion of its oppoſite ſides. It is not in order to inculcate the ſame practices that I enumerate theſe old names, but to remind you of ſome of the various uſes which the older ſurgeons made of rollers, and which you will do well to imitate, eſpecially in promoting the obliteration of cavities, and the reunion of parts, and in ſupporting thoſe places which are threatened with abſceſs.

You muſt learn to vary your practice according to the nature of the caſe, and eſpecially according to the parts concerned. If the ſuppuration be on the outſide of the faſcia, or ſtrong binding membrane of the arm or thigh, then your chief buſineſs will be to obſerve the rapidity with which the matter will undermine the ſkin; for the faſcia, like the membranes of a joint, excludes the inflammation, and reſiſts it; the ſkin only is inflamed, its cellular ſubſtance is deſtroyed; the ſkin, by being thus ſeparated from the faſcia beneath, is ſo far deprived of its nou-

POOLL.
CAPTAIN of the WASSENAER.

Drawn by IBell

Engrav'd by I.Stewart

inflamed, unſupported by veſſels on its lower ſurface, its cellular ſubſtance being entirely deſtroyed by the ſuppuration, there is great danger leſt it ſlough, with a total loſs and deſtruction of the integuments of the fore-arm, for example: injections, even of the moſt ſimple kind, are in theſe circumſtances ſo dangerous, that if unfortunately a ſtimulant injection be thrown in under ſuch an extenſive ſurface of diſeaſed ſkin, it will gangrene and ſlough; or if, under pretence of evacuating the matter freely, this inflamed ſkin be imprudently cut up with a biſtory, the ſkin muſt inflame to the very higheſt point, beyond what it can bear; and being unſupported by its natural veſſels, it will die and ſlough off. For theſe reaſons, then, you never are to uſe the knife; you are only to make fair counter openings; when you puſh through your probe, you may draw after it a fine and ſmall ſeton; but even a ſmall ſeton is too irritating, and you are to continue it only a few days till the opening be thoroughly eſtabliſhed; whenever you are ſenſible that the courſe of the matter is free, you muſt try to leſſen the cavity, and to keep this great ſurface of ſkin in contact with the parts below by a gentle roller; but the bandage muſt be rolled very gently and very equally, and your compreſſion muſt be made, not ſo much with firm bolſters, as with a handful of plucked lint laid over the whole *; you thus preſs down the ſkin that is already injured, ſo as to make it reunite, and you oppoſe a barrier to the further progreſs of the ſuppuration.

* The two drawings of abſceſs in the fore-arm illuſtrate what I have explained in theſe remarks. The drawing of the arm of Captain Joannes Marinus Pool, captain of the Waſſinaer, ſhows how abſceſs works along under the ſkin from the elbow to the wriſt. He was ſuppoſed to have been ſhot by a ball, but I am perſuaded this was not the caſe; the wound was made merely by a ſplinter; the hole was ragged, and was nothing like that of a ball; the wound was ſo immediately over the bone, that a ball paſſing here muſt have broken the condyle of the ſhoulder bone, and either gone through the elbow joint, or have been felt lying upon the bone. His arm inflamed, and by the tenth day after the battle, the whole ſkin of the fore-arm was undermined, and ready to ſlough. I made that opening through which the probe is puſhed, juſt in time to ſave the ſkin, and to prevent the abſceſs reaching the wriſt; a ſeton was drawn through it for three or four days, which brought the parts into ſo good a condition that it was then withdrawn. The lower opening was preſerved, and the ſkin laid flat, and reunited with compreſs and bandage.

The other drawing, viz. that of the arm of Charles Challoner, a marine, ſhows how a ball, paſſing clear through the arm, produces very nearly the ſame form of abſceſs, with a more ſuperficial wound. This man was working a caronade upon the forecaſtle, and was among the firſt wounded in the ſhip. He was not ſenſible of being wounded, but obſerving ſomething drop from him, he ſtooped to pick it up, and found it was a muſket ball. He put it in his waiſtcoat pocket, and continued working his gun. After his gun had been twice fired or ſo, one of his comrades called to him that he muſt be wounded, for that blood was trickling from his wriſt. He anſwered at firſt, that it could be nothing but the ſqueezing of

If the inflammation, in place of merely undermining the ſkin, go deep among the muſcles, then the matter finds new cavities and hollows to lodge in, makes new and crooked paſſages for itſelf from point to point; one abſceſs forms after another, the ſuppurations become very irregular and extenſive, and this is what ſurgeons incorrectly call a fiſtulous ſore. It is not ſo! for while the parts continue inflamed, and the ſuppuration good, the diſeaſe, however extenſive, is merely an irregular abſceſs; and what is chiefly required is ſome means of diminiſhing the number of irregular ſuppurations, and as it were concentrating the diſeaſe; for the ſurgeon ſeeing matter confined, the openings narrow and irregular, and new abſceſſes forming from day to day, is uncertain which way the matter tends. He knows that it is deſtroying the muſcles, and fears that it may be ſpoiling the bones; therefore he chooſes from among the number of openings thoſe two which ſeem moſt convenient for his purpoſe, and introduces a ſeton from the one to the other; or from one opening he puſhes down his long ſteel probe to the bottom of ſome recent ſuppuration, cuts out the probe, and ſo draws a ſeton

his fingers under the breech of the gun, but upon looking to his ſleeve he ſaw blood ſpouting out from a wound near the bend of the arm. Then his comrades made him go down to the ſurgeon, where, upon turning off his jacket, he found that the ball had paſſed through his fore-arm. A piece of lint was put upon it, and he laid himſelf down in the cable-tier, where he was ſoon after wounded a ſecond time with ſplinters in the other arm.

The ball muſt have entered while he was pulling a rope; it entered at the hole which is ſeen on the fore part of the arm; it paſſed under the bellies of the ſupinator muſcles, through betwixt the radius and ulna, and paſſed out at the elbow through the belly of the anconeus muſcle. Had ſuch a wound healed eaſily, and without much ſwelling of the arm, it ſhould have been let alone; but when it inflamed and ſwelled up, a free exit for the matter ſhould have been provided; but the opening was narrow, the ball had paſſed through the thick of the arm, inflammation and ſuppuration came on, the wounds were ſo cloſe that the matter was confined; and he endured great torture while the matter wrought its way downwards. The arm was monſtrouſly ſwelled; the abſceſs which is repreſented in the lower part of the arm began to form on the fifteenth day of the wound; it burſt through the ſkin and faſcia on the twenty-ſixth day of the wound, and the moment that the matter burſt out he was relieved from great agony. The leſſon which reſults from this caſe is very ſtrongly impreſſed from what the lad ſuffered. The abſceſs in ſuch a caſe ſhould be watched carefully, and opened early, and not allowed to deſtroy the fore-arm for a month nearly; for though it may be a very good rule in the affair of a common boil, or ſuperficial abſceſs, to ſay, "We will wait till it be ripe;" yet in a caſe where the internal parts are in danger, as ſoon as we diſcover the abſceſs it ſhould be opened; and if the probe paſſes downwards to any extent, a counter opening in ſome other dependent point ſhould be alſo made to prevent a ſecond abſceſs, and a new burſting of the ſkin. In this caſe, by neglecting a counter opening, the lower ſuppuration broke out into a very ugly, unmanageable and extenſive ſore; and the lad being thrown into a very foul hoſpital-ſhip, there appeared to me little chance of his being cured; yet he did recover after a long while, and with much waſting of the arm.

ARM OF CHARLES CHALLONER, MARINE.

J. Bell, del.

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through the moſt centrical part of the ſuppurations. This ſeton is not to be removed when the new opening is eſtabliſhed, it is to ſerve a more important purpoſe, it is to lead the pus to thoſe particular openings which the ſurgeon has choſen, it is to prevent the matter working deep among the muſcles, and draw into this ſingle channel the matter of all the collateral abſceſſes. The ſeton concentrates, as I may expreſs it, the inflammation and ſuppuration, and brings the diſeaſe into one direct line, ſo that we know where to apply our compreſs and roller; we ſo narrow the paſſages, and leſſen the quantity of matter, and empty the collateral abſceſſes, by the operation of this ſeton, compreſſion, &c. that in the end the ſeton may be withdrawn. This ſeton muſt be continued during the whole cure; but in ſuch caſes injections are never to be uſed; for this is not a true fiſtula, but an irregular abſceſs; the parts, though extenſively diſeaſed, are in a natural ſtate of ſuppuration, the cellular ſubſtance is open to an injection; an injection raſhly thrown into ſuch an abſceſs will not be confined to the diſeaſe, but paſs under parts that are ſound: the cellular ſubſtance being imprudently injected with any ſtimulant tincture, the whole limb will ſwell up, and the ſwelling and new inflammation will be reſolved only by the formation of new abſceſſes, and more extenſive ſuppurations *.

This is indeed the kind of abſceſs which often ends in a fiſtula, but yet it is not one; more commonly a fiſtula proceeds from ſome foreign body lodged deep, a ball, a piece of iron, a rag of cloth, or a ſpoiled bone, which prevents the healing of the wound: and the circumſtances and peculiarities of a fiſtula are very eaſily and naturally deduced from this cauſe! for where foreign bodies are lodged in the part, and of courſe, when foul matter is allowed to ſtagnate, the part where the ball is immediately lodged cannot eaſily heal; but the paſſages where this foreign body is not immediately lodged, recover almoſt their natural condition, and the only imflammation is at the bottom of the wound, where the foreign body lies irritating and ſupporting the flux of matter, which muſt

* It was juſt this fiſtulous ſore, with various openings, that the ancients called REDUPLICATIO VULNERUM; they plugged up the wound with firm tents, and confined the matter; the matter wrought backwards, forming various paſſages; upon introducing their probes, they found them enter, firſt one paſſage, then another; and ſeeing but one opening and two or more internal paſſages, they thought the wound was doubled. They ſaid it came about, Propter tremulentiam manus quæ vulnus infligit. Aut propter motionem agitationemque corporis vulnerati. They often managed their tents and injections ſo ill, as to have more than a mere reduplicatio vulneris. They had two or three irregular paſſages, not ſo eaſily accounted for by the trembling of the hand.

find its way out. Such a wound endeavours to heal, but cannot heal: It is a true fiſtula, the pain and great ſuppurations have ſubſided; even the general lax ſwelling of the limb is much abated; or if pain and inflammation comes on from time to time, it is when the openings contract, cloſe upon the matter, and threaten to heal; the orifices are ſmall, the paſſages irregular, narrow, deep, and crooked; the matter thin, ichorous, bloody, ſometimes black from the ſpoiling of a carious bone; the walls are tube-like, firm, and callous, and ſo condenſed, that an injection thrown into a true fiſtula cannot, as in an irregular abſceſs, go abroad into the ſound cellular ſubſtance.

Here our buſineſs is rather to excite inflammation, and provoke the ſenſibility of the parts. We uſe ſetons and injections in this caſe, with a very different, and much bolder deſign. Setons are uſed rough and large, that they may irritate; they are uſed, as bougies are (in caſes of ſtricture), to force the parts into a ſtate of ſuppuration, and to deſtroy the calloſity; and while they ſtimulate the callous tube, they make a free paſſage for pieces of iron, rags of cloth, or carious bones. They are, like bougies, often loaded with irritating medicines, as red precipitate mixed with baſilicon, and the cords are drawn through every day. We alſo inject a fiſtula ſometimes with barley water, merely to cleanſe the fiſtula; but oftener with tincture of myrrh, along with bark decoctions, to correct a putrid ichor, eſpecially when there are corrupted bones in the fiſtula, or where blood has been extravaſated through the cellular ſubſtance, which produces always very foul and fœtid ſuppuration. Sometimes we are really under the neceſſity of uſing eſcharotics, as injections of ærugo with oil, or ſtrong ſtimulants, as turpentine diluted into the form of a balſam, with oil, baſilicon ointment, or balſamum arcæi, which balſams we pour into the fiſtulous holes hot, but not too ſtrong; yet for a ſlightly ſtimulant and cleaning injection, perhaps there is not a better than rough red wine.

Even ſmall inciſions are allowed here. We lay open any ſmaller fiſtula in order to get a more direct paſſage for our ſeton or injection into the greater fiſtula, or to enable us to cure and heal up ſome collateral fiſtula. We alſo uſe ſometimes a ſponge tent, or piece of gentian, to dilate ſome particular opening, or to make way for confined matter; and when, by care, and various inventions and practices, we have obliterated the collateral fiſtulas, made good counter openings, procured a free vent for the matter, and brought the whole diſeaſe into one direct line; when, laſtly, we have brought the tube or inward

ſurface of the great fiſtula into the ſtate of an inflamed, active, and granulated ſore, and have converted the thin ichor, into a well conditioned pus, we endeavour, with our rollers and compreſſes, to reunite the parts, forming, by the manner of rolling, what the old ſurgeons called their Uniting and Expulſive Bandage *.

Wounds with collections of matter round a joint, are the moſt afflicting of any; the matter is reſiſted by the capſule, and makes its way round the joint, among the looſe cellular ſubſtance; it finds out the weak parts, as the axilla or ham, and works towards them, and often it draws the acromion proceſs of the ſcapula, or the olecranon of the ulna, or any other projecting bone, into diſeaſe. The joint then becomes ſtiffened and deformed, the integuments ſwell round it; in ſome parts abſceſs forms, in others the ſkin is wonderfully thickened; there is all the appearance of white ſwelling, but the cavity of the joint itſelf is not affected, though at laſt, if neglected, the diſeaſe penetrates into the cavity, and the true white ſwelling, or diſeaſe of the joint, is produced. When the ſhoulder or knee are thus maſſed by inflammation, hardened, as it were, into a cartilaginous knot, and perforated at all points with fiſtulous ſores, the ligaments of

* It has been long remarked, that nothing is more inſtructive than ſtupidity, whether it betray itſelf, or be detected by others; and I think the following caſe, which I have extracted from Mr. Ford's uſeful book on the Diſeaſe of the Hip-joint, is an admirable example of this; it is an inſtance of an ignorant fellow blundering upon the cure of a fiſtula in the breaſt, which would have done him honour if either he had intended what he did, or had underſtood what he had done.

"A. B. a gentleman of ſixty years of age, valetudinary in his conſtitution, ſubject to pulmonary complaints, was, at the approach of a very ſevere winter, attacked with a feveriſh indiſpoſition, which terminated in an abſceſs in the axilla. It was ſlow and indolent in its progreſs, but at length it maturated, and was opened freely by the knife. It continued to diſcharge for ſeveral months, ſinuſes being continually formed, all of which were opened. The wound contracted finally to a ſmall aperture, leading into a ſinus which extended far up under the pectoral muſcle. The operation of opening or counter opening was in this caſe impracticable. Irritating tents, the ſublimate troches, and injections of various kinds, were uſed, to produce a coaleſcence of the fiſtula, but all proved ineffectual. At length he had determined to content himſelf with his misfortune; but going out of town, he was overturned in a carriage, and ſuffered a compound fracture of the arm. He was then neceſſarily confined to his bed, and the arm kept in a perfect ſtate of quietude. At the end of ſix weeks he recovered from his fracture, and at the ſame time had the ſatisfaction of finding the fiſtulous ſore in the axilla completely united."

And, after all, then, none of theſe cruel tents and injections were needed; nothing, indeed, but a bandage to bind down the arm, and compreſs the fiſtula. This caſe ſhows us, that unleſs a man have a clear intention he can do no good in ſurgery. This ſurgeon had made the inſides of the tube raw and ſore by his injections and tents; he had only forgotten to put the ſides of the fiſtula together, after having made them raw.

the joint are thickened, its motions are loſt, and even the partial cure by a ſtiff joint, or Anchyloſis, is hardly to be obtained *. The agonizing pain and want of reſt, the diarrhœa, and hectic fever, which are inſeparable from this degree of irritation, often deſtroy the patient, or hurry us on to amputation. But while the diarrhœa and pain can be moderated, while the ſtrength laſts, you ſhould try to cure the diſeaſe by varying thoſe practices which I have juſt mentioned. You ſhould be careful not to relax the parts, nor hurt the little vigour that is left in them, by macerating the joint in a maſh of rancid poultice; you ſhould remember, that the ſkin covering ſuch a joint is much inſulated, and tends greatly to inflame, and therefore you ſhould be cautious in uſing injections! you ſhould be well aſſured that the parts are really fiſtulous before you inject, and you ſhould be the more anxious and prudent, becauſe the joint itſelf may be affected, and you may be driving a very irritating injection into the cavity of a diſeaſed joint; nevertheleſs, cleanſing, or even ſtimulant injections, barley water, diluted tinctures, or wine, I do not condemn. You ſhould be careful to watch abſceſſes, and prevent their extenſion, by ſmall and frequent openings with the lancet; perhaps it may be right to uſe a ſeton, in order to procure a free drain of matter. You may occaſionally enlarge one fiſtulous hole, in order to heal up two or three collateral holes depending on it. You ſhould uſe a poultice only after an inciſion, when the parts are irritated, and muſt be appeaſed; a fomentation you will uſe often, but you ſhould make it hot and ſtimulant, and continue it but for a ſhort while; you ſhould ſupport the joint with compreſſes, or rather puffy cuſhions of lint, and a gentle roller; but be fearful of tents, which both irritate the parts and confine the matter, rather enlarge the fiſtulas with the knife. If by a ſhot, or other wound, the bone be cruſhed, you eaſily diſcover it at firſt, but not perhaps the whole extent of the injury. If in a ſcrophulous boy, the acromion, or the ſternum, or any other bone, be ſpoiled by ſuppuration, you know it by the black and peculiarly fœtid diſcharge; you feel it with the probe through the many fiſtulous openings which run along the ridge of the bone; a man of experience learns even to know by the eye this ſtate of the ſore; and, if there be ſuch a diſeaſed bone, added to the other diſorders, and if the bone be projecting at one end, you ſhake it from day to day till you get it out. Or if diſeaſed integu-

* When ſuch a joint has been ſaved, but is knotted and hardened into a cartilaginous maſs, and the tendons and ligaments about it all fixed, we ſend the patient to watering places and hot baths, juſt as we would do a patient with common white ſwelling; and ſometimes he recovers ſurpriſingly.

ments cover the carious bone, having fiſtulous holes from point to point, you take your round edged ſcalpel and lay the openings all into one, and take away the diſeaſed bone. Far from ſparing the integuments, you ſhould open them freely; you will find them almoſt inſenſible, cartilaginous like the tube of a fiſtula, not bleeding when cut, but rather needing an inciſion to excite them, and eſpecially needing to be delivered of the diſeaſed bone, before they can enter again into a healthy action, and granulate or unite.

But ſometimes thoſe ſuppurations, though they do not abſolutely enter into the joint, draw the Burſæ Mucoſæ into diſeaſe, which are, as it were, a part of the joint, of the ſame ſtructure indeed with the capſule itſelf. This is a ſerious addition to the difficulties of the caſe; the great burſæ of the wriſt and ancle are, in plain terms, the ſheaths of the tendons; thoſe ſheaths are particularly cloſe; they enlarge as they approach the wriſt and ancle, and are bedewed with a very plentiful ſecretion: even in their healthy ſtate this ſecretion of the burſæ is in great quantity, but, when the burſæ are inflamed, it is aſtoniſhingly profuſe.

" A young man of the name of HEARTRY, a MARINE on board the ARDENT, was wounded with a long ſhaft-like ſplinter of wood, which ſtuck like an arrow upright in his leg, and was pulled out apparently entire. I had no reaſon to believe that any foreign body remained in the wound. This ſhaft had pierced the gaſtrocnæmii muſcles, or rather, I think, betwixt the gaſtrocnæmius and ſoleus, near where the tendon begins. Here was a part certainly deſtined to inflame; even had the wound been made by a ball paſſing clean through this part, it muſt (like the ſhot which paſſed through Challoner's arm) have produced inflammation, ſwelling, and ſuppuration, among the muſcles, and this ſhould have been foreſeen, and provided for. The wound, which was a ſtab with a very rude point (a kind of wound which never fails to ſuppurate), ſhould have been very freely dilated; for as it was not properly a gunſhot wound, there was no ſloughing to be expected, ſuch as might open the wound; the very inflammation, which was forming matter within, choked the wound without, and prevented the diſcharge. The ſuppuration went on inwardly; the leg ſwelled to an enormous degree; the original wound, thus cloſed by inflammation, was ſo callous, moreover, and ſo nearly healed, that when this lad came firſt under Mr. Kiernan's care, it was difficult to introduce a common probe; but when he did get the long ſteel probe introduced, it paſſed down nearly to the ancle joint. Mr. Kiernan dilated this upper opening juſt as he would have done a gunſhot wound, and

put into it a ſyndon (or ſmall ſlip of linen) to prevent its reunion, hoping, by compreſſes and an expulſive bandage, to prevent the matter getting lower. But unhappily for this poor fellow, and many others, Mr. Kiernan was called away to another department *. The matter had now worked its way ſo low down, that a COUNTER OPENING ſhould have been made; but this was neglected; his roller was awkwardly and careleſsly applied, without any decided intention, and the matter continued to work downwards along the Achilles tendon. When I was firſt called aſide in the ward, to ſee this leg, I do not think there could be leſs than three pounds of matter collected, reaching from the narrow tented wound in the calf of the leg to the heel, the whole leg ſwelled to a monſtrous ſize, the poor creature greatly waſted with pain and hectic. I put down the long ſteel probe, which paſſed from the ſmall wound above the middle of the leg to the hard ſkin near the heel; and having cut upon the point of the probe, the matter jetted out, and continued to run in a full ſtream. It was plain that the burſæ, which accompany the Tibialis Poſticus, formed a great part of the diſeaſe; but the nature of the diſeaſe was very clearly marked by the mixed appearance of the diſcharge; for before this counter opening the matter being always puſhed upwards, it was obſerved, that the matter which firſt came up through the narrow orifice was a foul and bloody ſuppuration, (plainly coming from an abſceſs of the common cellular ſubſtance under the Gaſtrocnæmii muſcles); but what came next was a thin, glutinous, waſhy-like fluid, which was manifeſtly puſhed up from behind the inner ancle, and plainly indicated a diſeaſe of the burſæ mucoſæ; from the time of putting in the ſeton, there was diſcharged at each dreſſing (that is, morning and evening), full two pounds of this thin and mixed ſuppuration; it run out like urine from the wound, horribly fœtid. Now you will obſerve, that from a very ſlight wound this young man loſt his health; he was at the time of my writing his caſe reduced to extreme weakneſs; he lay quite melancholy and deſpairing; indeed ſhould he live his leg will certainly be deſtroyed †:

* Mr. Kiernan firſt officiated as ſurgeon's aſſiſtant in the wards, and then was ordered to take upon him the care of the Diſpenſary, which was a loſs to the ſurgical department. He is a young man of much good ſenſe, conduct, and diligence in his profeſſion, and of ſuch excellent diſpoſitions, that when the troubleſome buſineſs of his own department was over, he continued to do good ſervice in the wards at every ſpare hour.

† Mr. Kiernan, at my requeſt, reſumed the care of this lad particularly, gave him his wine, porter, and anodynes, with his own hand, and his ſtrength and ſpirits were ſomewhat reſtored. It is juſt poſſible that he may be ſaved. I requeſted Mr. Kiernan to take once more this charge upon him, becauſe, after having

had he been ſtrong enough to bear ſuch an operation it would have been a charity to have cut it off. You ſee then the dangerous effects of allowing the diſeaſe to work its way to theſe burſæ; and now, in a ſecond inſtance, you perceive the ſad conſequences of not dilating the firſt wound, of not watching the inflammation, of not hindering the deſcent of the matter, of not making an early counter opening at the loweſt point; and where there is, as in this inſtance, a deep ſwelling, inflammation, and ſuppuration, with a ſtring of tendons and a ſet of burſæ leading the diſeaſe towards a joint, the abſceſs ſhould be watched with particular care *."

made this counter opening, I found for three ſucceſſive mornings the clew of ſeton cut away by ſome other aſſiſtant, and the ſeton withdrawn, not from any particular opinion, but from ſheer ſtupidity.

* I will here relate the caſe of a diſeaſe in one of the burſæ mucoſæ, which is by no means common. It happened to a young man, of the name of M'Gubbin, a carpenter, of twenty years of age, who had his ſhoulder hurt, or rather ſprained, about five months before he came under my care. While aſſiſting to ſet up a very heavy plank of wood againſt a wall, he obſerved it falling, and caught it upon his hand; his arm was beaten back with great violence, and immediately after he felt that his ſhoulder was much hurt; but it was rather ſprained in the violent action of endeavouring to ſupport the log of wood, or in withdrawing with a jerk from a weight which he was unable to ſupport, than by the actual weight; for he was ſenſible of a violent exertion, but was ſure the log never ſtruck his ſhoulder. Ever ſince this accident, though he has never been entirely diſabled, he has only been capable of doing the lighter kind of work, being always ſenſible of weakneſs and pain. About three weeks after the accident he firſt obſerved the tumour, which continued very ſenſibly increaſing for a month, and has, he thinks, been increaſing ever ſince. This tumour is very ſingularly large; it lies like a pillow on the top of the ſhoulder; the nature of it is by no means eaſily underſtood. It is regularly confined to the top of the ſhoulder, is not very tenſe, yields a little on preſſing ſtrongly with the fingers, but it requires ſtrong preſſure, for the tumour is deep ſeated, lying under all the fleſh of the deltoid muſcle. The nature of the tumour is not very decidedly marked; but three things are particular: 1ſt, There is ſuch a diſtinct perception of fluctuation, that one might almoſt pronounce that there is a collection of ſome fluid: 2dly, The ſubclavian artery, where it comes out upon the breaſt, beats ſtrongly, and is perfectly free; the pulſes at the bend of the arm and at the wriſt, are good and ſtrong, or are affected in no greater degree than is fully accounted for by the mere ſize of the tumour: 3dly, The tumour is limited to the top of the ſhoulder, lies neatly under the deltoid muſcle; the cup of the axilla is quite free, and its edges, the latiſſimus dorſi and the pectoral muſcle, are diſtinct and clear. It is ſuſpected by many gentlemen in conſultation to be an aneuriſm of the axillary artery; but of aneuriſm I have no apprehenſion, unleſs it were of the ſmall branch which paſſes round the ſhoulder, for the tumour keeps clear of the courſe of the great arteries, and there is no pulſation in it, nor is there that hard lumpy feel which the coagulated blood of an aneuriſm would probably give. There is no great chance of a ſuppuration ſo large in a part ſo naked as the ſhoulder joint; our ſuſpicion falls chiefly on the great BURSA, which lies under the acromion proceſs, or the diſeaſe may be in the capſule of the joint itſelf. It may be matter or blood, but more probably it is a gelatinous or ſerous effuſion. The preſent

But to return to the point of diſeaſed bones: it is a complication of the diſorder peculiarly frequent in gunſhot wounds; and I have one piece of advice to give you, which if I may gueſs from the ill conſequences of neglecting it, will be of ſome uſe. I adviſe you to take away diſeaſed bones the moment they can be diſengaged; for a diſeaſed bone is as a foreign body, which continues the diſeaſe, ſupports the inflammation of the ſoft parts, and hinders the continuity of veſſels, and the generation of callus within. It is, I acknowledge, againſt all rules of good ſenſe and diſcretion, to be inexorable in picking away or cutting out every little piece of bone which ſeems diſengaged at the time of receiving a wound;

pain and lameneſs, the certainty of continually increaſing tumour, the fear of its ſpoiling, or having already ſpoiled the bones, are ſtrong motives for operation.

This hiſtory was written in the hoſpital-books before the operation, which was performed in the following manner.——

OPERATION. After the outward inciſion of ſix inches, ſome gentlemen ſtill entertained apprehenſions of its being aneuriſm; but upon cutting next through the deltoid muſcle, I felt the ſac with the point of the finger, and pierced it with a common bleeding lancet; it was exceedingly thin. The puncture juſt admitted the point of the fore-finger. The matter diſcharged was not pus, nor was it tinged with the leaſt drop of blood, ſo that it had nothing of the nature of an abſceſs. This tumour, inſtead of a coat of thickened cellular ſubſtance, like common abſceſs, had a thin, ſmooth, lubricated coat, which proved it to be a BURSA, and the fluid was thin, pellucid, gelatinous, mixed with opaque grains, like meal or millet ſeeds; the quantity muſt have been two pounds, for the ſac now receives two pounds of warm water when injected. After evacuating the fluid, I paſſed a long probe into the ſac, and felt the tendon of the long head of the biceps: The head of the bone and the acromion were ſound; the internal ſurface of the bag ſmooth, lubricated, equable, and the cavity very large, the probe turning freely, by which I had my choice of bringing it out at whichever point I pleaſed; I brought it out above the axilla, through the broad ſide of the pectoral muſcle, juſt above the inſertion of its flat tendon. I have reſolved to clean out the ſac daily with warm water, to wait the natural inflammation of the ſac; and whenever pus ſeems to be generated, when the fluid changes from clear and gelatinous to opaque and purulent, to preſs together the ſides of the ſac in order to procure adheſion.

On the third day, the matter became very diſtinctly purulent; I preſſed together the inner ſurfaces of the ſac; but now, the ſixth day, have made no progreſs, becauſe in ſo large and irregular a ſac the preſſure cannot be made perfectly effectual. I have ordered a large ſponge to be uſed as a compreſs, and find it anſwer very well: No hectic fever, nor more pain than what is quite natural: Patient manifeſtly weaker; I hope that this weakneſs is from confinement; have ordered him to go abroad daily.

About twelve days after the operation it was reported, that the ſac could now receive only a few ounces of fluid. He was ordered to live full, with beef-ſteaks, wine and bark. On the 9th or 10th of February, that is, twenty days after the operation, he had the uſual ſymptoms of fever; he got a ſmart vomit, an anodyne; and on the 15th of the month, the fever being gone, the ſtrength ſomewhat recruited, the diſcharge from the ſac leſſened, and the quantity of injection which the ſac was capable of receiving being very ſmall, he was ſent home to have the benefit of country air.

for at firſt no man can decide what parts of a bone are diſconnected or irrecoverably deſtroyed; but where a bone has been fractured by a muſket ball (which never fails to deſtroy the organization of the bone), where, in the courſe of a long ſuppuration, a bone becomes looſe; or where a bone has gradually become carious, and we have obſerved the diſeaſe through all its progreſs; or where a bone which at the time of receiving the wound did not ſeem looſe, is in the end diſengaged by ſuppuration, the condition of ſuch bone is very unequivocal, and it is equally plain what we ought to do. The ſooner ſuch a piece of bone comes away the better: I ſay comes away, for I would have you to leave this buſineſs in ſome degree to nature: I would have you prudent, but not negligent: I would have you wait till the bone be in ſome degree looſened by the natural proceſs, but not till it be expelled. Such a carious bone is effectually a foreign body; neither can the integuments recover, nor can callus form, while it remains. While it remains, the ſinous ulcer continues without hopes of a cure, a putrid ichor is diſcharged, and the patient continues to be exhauſted with the diſeaſe. I know no one good effect of delay; I know no reaſon why the bone ſhould not be pulled away; it is looſe, nature has diſengaged it, and perhaps can do no more; if after it is looſe you will leave it there, you may leave it for an indefinite time, and the patient will pay the price of your timidity and careleſſneſs. I have ſeen ſurgeons who, had it been a ball which had kept the wound open, would have been in great haſte to get it out, and would not have been over ſcrupulous about the means; but a dead and dry bone, worſe than a ball, within their reach too, they will not touch, ſaying, it is to be left to nature, becauſe nature diſcharges diſeaſed bones! There is no doubt that nature will free herſelf, in the end, of any diſeaſed bone; but that is no reaſon why nature ſhould not be aſſiſted; if this were really a reaſon, it would ſtrike deep againſt many of the moſt uſeful parts of ſurgery. I have ſeen a bone ſticking for ſix months, like a truncheon, out of a wound, which one ſmart twitch with the finger and thumb, or a ſhake now and then, would have diſengaged, even while the patient was aſleep. Therefore I give you this advice, to diſengage diſeaſed bones as early as you can, without abſolute violence; the worſt that can happen is, that, by ſhaking the bone too freely, you give a little pain, or bring a little blood, which is over in a moment. Even when there is a necroſis, or, in other terms, a new bone generating to replace that which is ſpoiled, where there is a proceſs going on very intereſting, and which we are unwilling to diſturb, we do not ſpare even this new ſhell

of bone, but ſplit or cut it up, to get out the old one, which protracts the cure; if we do this in caſes of necroſis, much more ſhould we cut up the integuments, and pull out a bone which is ſimply carious *!

When in place of a deep and bruiſed wound, you have a flat and ſuperficial wound, it often degenerates into a ſore; and the methods by which the cure of ſuch ſore or ulcer is attempted are very univerſally known. Occaſionally, a ſore may be wrapped up in a poultice, or ſoaked in a ſtimulant fomentation to cleanſe the ulcer, or to abate any pain or inflammation which our medicines may have raiſed; but a continued uſe of common poultice, of carrot poultice, of ſtale beer poultice, or any other, ſerves rather to relax and hurt the part. I believe, that very univerſally the cure depends on the prudent uſe of aſtringents, eſcharotics, and cauſtics, which muſt be changed according to the condition of the parts, and moſt eſpecially it depends on perfect cleanlineſs and a firm bandage. If the ſore be going ſlowly but regularly on, it requires only ſuch ſlightly ſtimulant ointments, as Turner's cerate, or unguentum tutiæ, or ſome other ointment made with zinc. If it be red and freſh granulating, let it be dreſſed with dry lint in the baſin of the ulcer, and ſtraps of ointment round the edge. If the action of the parts flags at times, and the ſore looks gleety and pale, ſharpen the ointment by adding a little red precipitate to it, or ærugo, or a little dried alum. If the edges are quite callous, they muſt either be touched with cauſtic daily, or pared with the knife; for if this be not done, the edge of the ſkin being by this calloſity diſengaged from the ſoft parts, ſhrinks and waſtes. If the ſore be flabby, with a profuſe diſcharge, ſharpen your ointment by adding to it ſome ſpirits of turpentine; the ſore will often be ſo inſenſible as to require to be fairly powdered with pure precipitate. If at any time theſe proceſſes for ſtimulating a ſore have been too ſuddenly entered upon, or too harſhly followed up, ſo as to

* I never ſhall forget the condition of a boy I ſaw who had fallen down a hatchway. His ſcapula was cruſhed, and his arm bone was broken; the arm bone was left ſticking out full three inches, the arm ſo turned round and diſtorted that the back of the hand lay upon his rump. He lay in a crooked poſture, in the greateſt miſery, had large poultices, forſooth, laid about his ſhoulders, and was very cruelly and croſsly uſed by nurſes. A creature more exhauſted, more wretched, I never ſaw in all my life. Had the arm at firſt been extended, and the bone reduced, he muſt have been a very fine young man; had the bone even been plucked away after it became carious, and before he fell into the laſt ſtate of weakneſs, his life might have been ſaved. The bone was ſo looſe, ſo entirely carious, and ſo detached from the ſound part of the bone, that it was taken away, not by a twitch, but was lifted eaſily out as it were from among the fleſh, which had no hold on it. I did not ſee him abſolutely die, but am ſure he could not live many days.

excite inflammation, you muſt apply a poultice, or rather a warm fomentation of camomile flowers, with crude ſal-ammoniac, till you reſtore the ulcer to a quiet and eaſy condition.

But an ulcer, eſpecially a ſailor's ulcer, is the opprobrium medicinæ; we have no perfect theory to lead us in our practice; each application has in its turn been proclaimed an infallible cure; but the methods which are extolled to-day, are deſpiſed to-morrow *. To commend any of them as infallible, would be very wrong. I would rather leave you to your own good conduct, and to the practice of thoſe methods which you find in every book, and ſee uſed in ſurgical wards from the firſt day of your entering upon your pro-

* It is impoſſible to be ſerious while we enumerate the thouſand remedies which have been applied to ulcers; not that our diſappointment in removing ſo afflicting a complaint can be matter for ridicule, but the vain boaſtings of ſelf-ſufficient inventors ſurely are ſo. Ulcers have been dreſſed with precipitate, calomel, alum, vitriol, zinc, verdegreaſe, pulvis ſabinæ, and other DEVILISH DRUGS; they have been powdered with ſugar, chalk, charcoal, aſſafœtida, rhubarb, and other INNOCENT DRUGS; they have been plaſtered with turpentines, balſams, mel mercurialæ, decoctions of walnut leaves in ſugar, (which Belloſte proteſts to be a medicine ſo powerful that no ulcer can reſiſt it). I have ſeen ulcers, extending from the os iſchium to the ham, or covering the whole back or thigh, like Joiner's, dreſſed, with what—why with garlic and ſpirits! while others have thought fit to dreſs them, like warts, with faſting ſpittle, or raw beef, or the gaſtric juice. Ulcers have been ſqueezed into a good humour by compreſſes and firm bandaging, ſtrong ſticking plaſters, plates of lead faſtened upon the ſhins, ſponges, cakes of Paris plaſter, &c.; or bladders have been fixed about ulcers full of fixed air, carbonic air, vital air: What is there, indeed, that has not been tried. If you ſhould wiſh to ſee all this farrago of empyriciſm treated with the pomp and ſolemnity of ſcience, look to Mr. Hume's Treatiſe on Ulcers, in the Surgical Tranſactions. This ſingular ſuite of experiments (as they are called), conſiſted in trying all ſorts of powders; and the precious additions that we have from Mr. Hume are, tartar emetic! true Turkey rhubarb, chalk, Paris plaſter, caſſada root, lapis calaminaris, ipicacuanha, the flour of muſtard, gentian, camomile, Columba root. But I dare ſay the reader has enough of this. I never heard but of one perſon who flattered himſelf with the expectation of becoming the greateſt ſurgeon in Europe, by finding out a cure for ulcers; the birth and death of that gentleman's hopes is related in the following paragraph: "Id quippe contigit Domino Abbati Bourdilotio, qui me conſcium eſſe, voluit mentis ſuæ quo tempore una cum illo verſarer in Ædibus Condæis ſanguinem miſſurus Sereniſſimæ Principi. Acri ille fretus judicio animadverterat, in ulceribus adeſſe, acre quoddam diſſolvens, cujus motus inhibendus foret, atque obtundendi aculei admoto quopiam leniente; eapropter ratus eſt fruſta CARNIS VITULINÆ crudæ adplicata excellenti fore remedio; conjecturam hanc ſuam tanquam arcanum eximium mihi propoſuit, CUJUS OPE IN SUMMUM CHIRURGUM EVASURUS ESSEM, CUI PAREM EUROPA NON FERRET, aque inſigni verborum energia ad experimentum me impulit in Noſodochio Charitatis: ſed res infauſte et illi, et mihi ſucceſſit, neque eventus votis reſpondit ab humiditate enim carnis vitulinæ in tantum adducta eſt ulcerum putredo, ut ægri quaſi veneficio infecti, in diſcrimen vitæ adducti fuerint, ac cadaveroſa illa medicamina miſſa facienda fuerint, locum factura remediis ordinariis."

feſſion; for on this ſubject I feel myſelf obliged to ſpeak to you with that reſerve and diffidence which is becoming in the preſent ſtate of our knowledge. This is indeed a ſubject concerning which the beſt inſtructed in our profeſſion would not willingly undertake to give a decided opinion.

Perhaps on this, as on many other occaſions, we look too anxiouſly towards the diſcovery of ſome particular cure, while we neglect to inveſtigate the general nature of the diſeaſe, the only kind of reaſoning which can lead to a juſt concluſion; it ſeems indeed as if, in many inſtances, we expected the cure of diſeaſes from chance, having no confidence in thoſe reaſonings concerning the animal economy of which we are nevertheleſs ſo proud. That healthy but ſtrong action which reſtores wounded parts, by producing adheſion, we have been long accuſtomed to conſider as a ſtage of inflammation; and inflammation, of courſe, has been underſtood to perform, or at leaſt to aſſiſt in the cure of wounds. But I have ventured to proteſt, that inflammation is unequivocally and always a diſeaſe; that it is inflammation alone that prevents the cure of wounds, or converts a wound into a ſore. I would now add, that inflammation either ariſes at the firſt from debility, or, at leaſt, very ſoon produces it; that the inflammation which cauſes ulcer is founded in debility; and that an ulcer happens only in a debilitated part.

The moſt tedious and perſevering ulcers are thoſe which ariſe from habitual debility! ſuch are ſcrophulous and conſtitutional ſores. The moſt ugly, deſtructive, and horrible ulcers, are thoſe which ariſe from ſome poiſon infuſed into the ſyſtem, deſtroying the temperament and living powers in the parts! ſuch as the cancerous or venereal poiſons, the ſibbens, the yaws, the rot poiſon *. The ulcers which are the moſt in danger of becoming gangrenous, are thoſe where the vis vitæ of the whole conſtitution, or of the particular part, is deſtroyed; as in dropſy, or in fractures of the ſpine. The ulcers which are the moſt fearfully rapid, are thoſe of hoſpitals and camps, which ariſe from what I may call a concealed fever lurking in the conſtitution, which ſhows itſelf ſometimes in the conſtitution by an inexplicable diſorder, paleneſs, faintneſs, nauſea, diarrhœa, a quick, hard, and fretful pulſe, and a continual threatening of fever; and frequently by rapid changes of the ſore, and even, at times, ſudden gangrene without previous fever. The habitual ulcer of warm climates is owing to that uninterrupted

* For an account of the rot poiſon, vid. Paterſon and Vaillant.

debility of conſtitution, which ſhows itſelf in various forms of diſeaſe: ſometimes it appears in the form of fever, ſometimes of a dyſentery, ſometimes of intermittent, ſometimes the perſon ſo debilitated is ſubject to the liver diſeaſe, ſometimes to the Cochin or Barbadoes leg, and very often to conſtitutional ulcer. In thoſe perſons with whom the conſtitutional diſorder of warm climates is not ſo far advanced as to produce ſpontaneous ulcer, every wound is yet ſure to degenerate into a ſore; for in a ſyſtem thus indiſpoſed and weakened, the living powers of any individual part are apt to be ſuddenly exhauſted, are unable to ſuſtain a high or long continued action; and hence probably a wound becomes an ulcer, inflames and ſwells, with a profuſion of undigeſted matter.

Theſe are the various kinds of ulcer ariſing from conſtitutional debility; and every local debility produces in like manner local ſores. Of theſe there are chiefly two kinds, firſt, That which may happen to any part of the body where, in conſequence of a wound, violent inflammation has enſued, carrying the excitement to that height, which the debilitated conſtitution of the part is unable to bear. Then the parts become flaccid, and run into ulcer, which is to be cured by exciting them, chiefly by thoſe topical applications which I have juſt mentioned: Or, ſecondly, A local ulcer may ariſe from that peculiar weakneſs of the lower extremities, of which we have ſo many proofs; for it is there that leucophlegmatic ſwellings, varices, ulcers, and all the earlieſt marks of conſtitutional debility, firſt appear.

Of theſe ulcers, that which is in a manner peculiar to the lower extremities, is by far the moſt frequent. The cauſe of this weakneſs is merely the dependent poſture of the parts; and it is ſurpriſing how often we have approached and yet miſunderſtood the true theory of this diſeaſe: to ſay that ſuch an ulcer is difficult to cure, from the dependent poſture of the part, appears too ſimple and obvious to be thought worthy of attention, and yet it is the truth, and probably the whole truth. This has long been obvious, and yet very little obſerved; it is as certainly known that an ulcer of the leg may be cured by keeping it on a level with the body, as that a ſuſpenſory bandage is uſeful in diſeaſe of the teſticle or ſcrotum; an ulcer is cured merely by keeping the diſeaſed limb in the horizontal poſture; the patient walks abroad, and his diſeaſe returns! the ſurgeon ſees the ulcer alternately cured, and breaking out, without ever apprehending that a ſteady and continued ſupport is the only one thing wanting to a permanent recovery. Here we ſee the unhappy conſequence of not having a

right theory; hence it is that we travel unconſcious, over and over, the very ground where our treaſure lies hid; we have known the true cure for ulcers of the tibia for half a century, we have ſometimes ſucceeded, ſometimes failed; we have at times come near to the perfect practice, then left it off, then reſumed it again, and all from not knowing the meaning of the real import of thoſe methods which are uſed, or the cauſes of our alternate ſucceſſes and diſappointments. We have long uſed bandages, leaden plates, adheſive plaſters, ſponges, and other means of compreſſion, without knowing that it was by ſupporting the parts that theſe were ſometimes ſucceſsful. Even a word, a name, is of critical importance in a matter like this; had any of thoſe who have pretended to cure ulcers by compreſſion had the good fortune to ſay "they cured them by ſupporting the parts," then would they have caught even by the ear the true theory, they would have been careful not to make partial and painful compreſſion by plates of lead, nor partial ſtrictures by rollers bound only round the diſeaſed part; they would have been careful to ſupport the parts generally, and to apply their rollers from the very extremity; their bandages would have taken a very different form; they would have learnt that manner of bandaging for the cure of ulcer, which I ſhall explain to you more particularly in my next diſcourſe: at preſent I ſhall employ myſelf rather in pointing out thoſe peculiarities of ulcer which ariſe from a peculiar condition of the faſcia,—from the accidental generation of worms,—from uncleanlineſs, ſpoiling the texture of the ſkin,—and from infection of hoſpital ſore, or of any other prevailing diſeaſe.

You will very commonly find the general Faſcia or tendinous ſheath which covers the muſcles much concerned in ulcer; and I am perſuaded that the unyielding nature of this part, more frequently than any other cauſe, protracts the cure. An ulcer ſeldom penetrates deeper than the ſkin, it is ſeldom able entirely to perforate the faſcia; it is the ill condition of this inſenſible part that makes a ſore continue throwing off ſloughs for months, and ſpreading continually; for this tendinous ſheath which lies under the ſkin being dead, deprives the ſkin of nouriſhment, by deſtroying the intermediate veſſels; the ſkin cannot cloſe over a part which is dead, any more than fleſh can cloſe over a carious bone; nor can it continue ſound at its edges, ſince its edges lie over the dead faſcia, unconnected with it, and no longer nouriſhed by veſſels: the ſkin thus ſhrinks from a part with which it can hold no connection, and the inflammation and the matter working backwards in every direction, deſtroy more and more the cellular ſubſtance which lies betwixt

the fascia and the skin. This I know is the condition of most of those sailors ulcers and hospital sores which I have seen: What can a sprinkling of precipitate, or of some drug still more insignificant, do in such a disease? The fascia, when once brought into this condition, is like a diseased bone, its connections are strong, it does not slough off soon, but keeps its place; the filthy, yellow, thick, and mucous-like matter of such an extensive ulcer, is produced by the gradual melting down of this fascia. When we clean such a sore of perhaps three or four hand's breadth, we cannot but remark the strong analogy betwixt the matter which it discharges, and the stuff which we scrape off from an anatomical preparation, for there also it is the fascia belonging to the interstices of the muscles that produces that foul matter which costs us so much pains to clear away. Upon removing this cream-like stuff from the surface of a deep ulcer, we see the fascia covering the bottom like a sheet of soaked shamoy leather; with such a bottom as this the ulcer can never heal, the fascia itself is dead, and will never recover; it sloughs off more slowly than even a diseased cartilage or bone. Now I know that this is often the impediment to the healing of great ulcers; that the ulcer is perpetuated only from this diseased and yet unyielding state of the fascia, and this has been the occasion of many losing their legs; it is the very ulcer for which many men are reported incurable, and discharged the service. The habit which first produces such an ulcer is very bad; the ulcer itself, which extends so as to uncover the fascia in this manner, cannot be easily cured, although the fascia were cut away; but while it is left the ulcer cannot heal, you must therefore learn to pare and clip the fascia; and it will be some encouragement to you to know that I have often cut it up with the knife, then pared the flaps with scissors, cleared the leg of it in a few days, and brought the ulcer very suddenly into a healthy and granulating state.

When ulcers are long neglected, the worms which breed in them give a dreadful appearance to the disease. This is a shocking accident, very often seen in moist and warm countries, in the autumnal season. In hospitals where men are brought with deep large long neglected sores, worms breed very fast, and most especially in those parts on which the patient lies, so as to prevent its being cleaned; "At Stirling in Scotland, says Wiseman, all those wounded in the back and hinder parts were full of maggots, not having been dressed for some days." Though plainly this kind of ulcer, the Ulcus Verminosum, proceeds from uncleanliness, from flies being allowed to deposit their eggs in

a nidus, very fit for hatching them, yet with ſuch rapidity are the worms brought forth, and ſuch myriads are found crawling in the baſin of a great ſore, that one can almoſt excuſe the ignorance of the older phyſicians, who abſolutely believed that the worms were generated by putrefaction merely, without any depoſition of eggs; Overcamp was ſo abſurd as to imagine, that the mucus of the guts, or of a ſore, might be rolled up into the ſhape of worms, and at laſt get life and become real worms *. Chriſtianus Steenvelt, in his letter to Bidloo, was the firſt who obſerved the real cauſe of the generation of worms in ſores. He mentions the confuſed notions of Ruiſch as being too equivocal to be underſtood or refuted; but we can have no difficulty in underſtanding the opinions of Ruiſch; for though in the paſſages which Steenvelt quotes, Ruiſch works up the ſubject into a fine piece of learned confuſion, yet one fact, in another part of Ruiſch's works, intimates to us plainly, that he was of the old opinion; I dare ſay he believed with the other learned people that worms might paſs by the blood and circulation into the liver and guts. Upon cutting open ſome thigh bones (old diſſecting-room bones), he found flies in them, and wondered how they got there, never imagining that the flies might depoſit their eggs; the eggs ripen into worms, the worms crawl in by holes of the nutritious arteries, to the meddulary cavity of the bone, and there become chryſaliſes, and ſo change into flies! that the worms and the flies were generated there by putrefaction, was ſurely the notion of Ruiſch. In this ſtate of the matter Chriſtian Steenvelt was obliged to convince the medical world by a very plain experiment: in a caſe of compound fracture of the tibia, where there was an ulcer of this kind; he ſcooped out about fifty worms from the crater of the great ulcer, laid them by the kitchen ſtove, and gave them to the ſervant girl to nurſe, which ſhe did ſo faithfully, that they fed and fattened, changed into chryſalis, and on the fourteenth day became flies †.

I never ſhall forget the ſight I once ſaw in our well regulated and cleanly hoſpital, where there was ſuch an exhibition of ULCERA VERMINOSA, as perhaps never was ſeen even by Paree at the ſiege of Turin. Dr. Aitken had taken

* Miravi ſatis non poſſum Overcampium, eo deveniſſe dementiæ, ut ſtatuere non fuerit veritus, motu vermiculari materiam putreſcentem poſſe converti, parari, diſponi, formari, in vermes.

† Vermes numero quinquaginta vivere moveri creſcere cœperunt, hi capſula incluſi calidoque in loco depoſiti ſpatio ſex dierum in chryſalides ſive corpora oblonga duriuſculo cortice vel cute contecta, efformabantur FAMULA MEA HÆC FOVENTE SOLLICITE poſt quatuordecim dies in muſcas mutabantur

an apprehenſion that we were too apt to trouble ſores by officious dreſſing, and being deceived, like many others, by the wonderful reunion of freſh wounds, when laid together, and not dreſſed for eight days, he formed this promiſing concluſion, That, as according to the common ſaying, the "blood is the beſt balſam for a wound," "its own foul matter ſhould be the beſt balſam for a ſore." He reſolved not to dreſs the ſores of the ſurgical wards at ſhorter periods than five or ſix days, but that the matter might not run through the bed during that period, he made the nurſes gather all their old ſponges, and applied to each ſore a ſponge. Four or five days after a great many gentlemen attended in the wards on the tiptoe of expectation for the further iſſue of this experiment! each ſore, as it was ſucceſſively opened, was in a horrible condition, "the worms they crept in, and the worms they crept out," and the Doctor was in great diſgrace till he diſcovered the cauſe. He had given the nurſes very ſtrict injunctions about cleanſing their ſponges, which they very ſtrictly obeyed; but each ſponge, after being waſhed, was laid by the window to dry; it was hatching ſeaſon with the great flies, who were very glad of the ſponges to depoſit their eggs in; and when theſe eggs were laid into the ſores, and kept there for ſome days with all the advantages of ſuch a ſituation, they did hatch with a vengeance *.

The military ſurgeon has very frequent occaſion to ſee the ulcus verminoſum in warm climates, and in much neglected ſores; and though theſe myriads of worms were not actually to corrode nor irritate the ulcer †, yet they are ſuch an indication of its ſad neglected condition, that they muſt immediately be removed, let the accident which produced them be what it will. The ſores muſt be waſhed clean, and dreſſed dry, and if worms ſhould continue to be generated, decoctions muſt be applied of wormwood, rue, or any bitter herbs, or a ſolution

* Dr. Aitken's vindication of himſelf may be ſeen in his Principles of Surgery.

† That worms will bite and corrode the fleſh is moſt ſatisfactorily proved by Thamur in his account of the Salomonii Vermi, which wrought much of the ſtone and marble work in Solomon's Temple.

Salomonem cum marmor Parium ad ædificationem templi e remotis partibus convehi præcepiſſet, conſcium prohibitionis legis quæ vetuit altaris ædificandi lapides ferro incidi quæſiviſſe experimentum in vermibus Salomonicii quod ars humana neſcivit: pullum ſtruthionis in vitreo vaſe recluſiſſe, quem cum videret ſtruthio et habere nequiret, naturaliter agnitam artem attentans, in deſertum cucurrit redienſque vermiculum tulit cujus ſanguine vitrum linivit et confractum eſt, ſicq. fœtum eripuit; quod (ait auctor) videns Salomon hoc experimento eodem genere vermis in inciſione duriſſimi marmoris uſus eſt, &c. No one would think of diſputing the fact, but it is natural to wonder how Solomon came by the electrical jar, which he ſeems to have uſed in this experiment.

of corroſive ſublimate. Bidloo, in the cure of thoſe wormy puſtules which he often ſaw in the camp, and which probably were owing to the men's ſleeping on the ground, always uſed a mercurial waſh; and Steenvelt an ointment made of venice turpentine, aloes, mercurius dulcis, and yolks of eggs mixed up: or he ſprinkled the ſore with a powder made of aloes, myrrh, and nitre, a compoſition which is often uſed by the army ſurgeons on the Continent, eſpecially in gangrenes and gunſhot wounds, with extenſive caries of the bones. This powder will effectually prevent any accident of this kind, and contribute alſo to the cure of the ſore *.

But it is not merely from this collection of vermin that uncleanlineſs makes formidable ſores, for it will ſpoil the texture of the ſkin; and (without any other cauſe that we can perceive,) produce the moſt extraordinary ulcers. I ſubjoin M'Gillivray's caſe as an example the beſt calculated to explain this poſition; for his wound was extremely ſmall, the ulcer which followed was very ſingular, both in extent and appearance, and was finally cured, rather by care and cleanlineſs than by ſurgery! Yet what is ſurgery in this caſe but cleanlineſs and care?

This man, who is about fifty years of age, was a ſerjeant in the ſixty-eighth regiment, was landed on the Continent with Lord Moira's army, was in the ſiege of Nimiguen. When the Waal froze over, ſo that the French were able to croſs it, they attacked the Britiſh army, and during the retreat this man was of the covering party, being one of about three hundred who had the care of the baggage. They were ſuddenly ſurrounded by three thouſand French, who formed a circle, and cut them off from the camp, which was formed in a valley about the diſtance of two miles; he was ſtanding by his baggage waggon firing, and had fired four or five rounds when he was wounded. He ſaw no man fall before himſelf; the laſt thing he remembered was to have ſeen an irregular fire upon his ſmall party in all directions; he was ſenſible of being wounded, but felt no pain; fell forwards upon his face, and lay for a long while, and when his ſenſes began to return, he found his hand lying upon his breaſt over the wounded part, his hand and clothes bathed in blood. He turned on one ſide, and

* Theſe powders of rhubarb, bark, myrrh, and aloes, &c. when applied to ſores or gangrenes, are not only uſeful by their ſtimulant powers, but are really the ſofteſt applications poſſible, and the beſt abſorbents of ſoul matter. The Indians lay their little children in baſkets filled with powder made of the barks of trees, where they lie ſoft and warm, and all moiſture and filthineſs is abſorbed.

J. Bell del.

James Macgilvray

perceived himſelf in the midſt of a group of French ſoldiers, who were looking upon him compaſſionately; when he ſtretched out his hands, they were affected with this ſign of life; they raiſed him up, and continued ſupporting him; one of them put his canteen of ſpirits to his mouth, and gave him a little, which revived him. As ſoon as he was able to turn round, he ſaw his wife (who had alſo been ſhot), fallen from the baggage waggon, and lying dead, and their little boy, then about two years old, climbing upon her breaſt. The ſoldiers led him up to the ſpot; he took the child into his arms, and wrapped it in his plaid, but they ſoon were ſenſible that he could not carry the child, and they took it from him; he pointed to the dead body, and offered them ſome crowns he had in his purſe to bury it. They dug a hole, and were burying his wife, when the alarm having reached the Engliſh camp, the French were attacked in their turn, the baggage was retaken, but he and his boy were hurried away, and thrown into a French priſon in Nimiguen, where he continued to ſuffer all kinds of miſery for nearly three years.

The ball had entered under the clavicle, and paſſed out behind; the great veſſels had eſcaped, but the ſmaller arteries which were cut bled freely. It was three days before the French ſurgeon viſited him; he paſſed a long probe through the wound, from back to breaſt, and drew after it a large ſkaine of cotton-wick, in hopes of entangling and drawing out any pieces of the coat or ſhirt, or ſhattered pieces of bone. This ball had entered beneath the clavicle, and paſſed out beneath the ſcapula: it had entered when he was ſtooping forward firing his piece; had croſſed the thorax, which is very narrow at its upper part, raked all along under the ſcapula, and had come out pretty low in the back; not a bone was broken, nor was there any wound of the lungs, for he never had the ſlighteſt impediment in breathing, nor did he ever cough up blood. After his firſt viſit he was ſo entirely neglected by the French ſurgeon, that he was obliged to have recourſe to one of his fellow-priſoners to waſh the wound ſometimes with a bit of ſponge; he ſcraped his ſhirt into lint, and applied a little daily to each end of it. The miſeries which he endured in various priſons for two years and eight months, brought the wounded part into the wretched condition in which it was when I ſaw it. In winter he ſuffered extreme cold; he lived on bread and water only; and of the black bread which he got, his allowance was but one pound a-day; no ſurgery, no opportunity of cleanlineſs, no care. After his health had been injured by cold and hunger, the heat of ſummer,

in a close wooded country, corrupted the skin, and covered his shoulder with this terrible ulcer; half a year had elapsed from the time of his being wounded before the surrounding parts began to degenerate into this very singular sore.

The sore never appeared to heal during the heat of summer. The skin all around both wounds (and to great extent), grew livid and very dark coloured, then broke out into white pimples; the pimples afterwards burst, and discharged imperfectly a white viscid matter; two or three pimples ran together into one, and formed a sore; then a scab covered that sore, confined the matter, made the inflammation spread, and comprehended other pustules; these, again, were in their turn closed up, the skin was undermined by successive pustules uniting; from pustules they became abscesses, and from trivial abscesses, deep inflamed sores. During the progress of this ulcer, the fœtor of the matter was such, that the whole prison was infected with it. The poor man could indeed get his sore washed with water; but no diligence could mend his condition; the fœtor was quite sickening and oppressive to himself; the ulcer spread first round the wound in the breast, then round the back over the whole skin, which covers the shoulder joint, then over the scapula, then up the neck, and down the whole side; the skin became remarkably livid, everywhere greatly thickened: in one place, hard and callous, in another, soft and boggy, as if there were matter under it, although there was none; in one place an abscess was forming, near that was another abscess entirely ripe, and close to that another burst, and discharging yellow, very viscid, and mucous-like pus, which undermined and destroyed the skin. These various abscesses, in all stages of progress (like ripe and unripe fruit on one branch), worked, not superficially, but deeply among the cellular substance, and the whole skin was puffed up; you might have felt the matter in these abscesses fully a month before they burst; and while they were working under the skin, the veins were eroded, and the blood burst out, sometimes so freely as to bleed like the vein of the arm. He frequently bled to the amount of two pounds at once, and much of the blood was, at the same time, driven under the skin, by which there was mixed with the dark red of this chronic inflammation the blackness of echymosis; and along with the hardness and callosity of inflamed skin, there was from point to point a pulpy feeling, as if, of anasarca, echymosis, and abscess, united. There were besides two or three flat, thrombus-like tumours, fully three inches in diameter, which when pricked with the lancet emitted only blood.

This disease being merely a corruption of the skin, arising at first from his dirty

and miſerable ſituation, and perpetuated by one little abſceſs after another undermining and deſtroying the ſkin; the plan which I laid down for curing him was this: I ordered him the warm bath, gave him a purge, and put him on good diet, with a little wine; I directed the warm bath to be repeated three times a week, to ſupport a ſoft and pleaſant ſtate of the ſkin; and a fomentation of camomile decoction, crude ſal-ammoniac, and a little ſpirits to animate the ſkin, was applied to the ſhoulder for one hour every morning and evening. The chief point was to manage the little abſceſſes and thrombuſes ſo as to prevent their undermining the ſkin. I opened two or three with the knife; and taught his dreſſer how to cut each irregular abſceſs as it formed, down to the bottom, with a direct inciſion, till he reached the ſound fleſh. Each abſceſs was accordingly cut before it was fully formed, with the knife, if large (as ſome of them were three inches long), and with the lancet, if ſmall. The inciſions were not made in what may properly be called an abſceſs, but through a piece of diſeaſed, ſpongy, and ſuppurating ſkin. The matter and blood were thus prevented from undermining the ſkin; the inflammation was drawn away from the ſwelled parts towards thoſe occaſional inciſions, which became then, as it were, the centres to their own proportion of the diſeaſe, and each ſcarification was filled with a ſtrong mercurial ointment, rubbed in very thoroughly with a hair pencil. The conſequence was, that each inciſion being ſtimulated into a right and healthy ſuppuration, was made to relieve the adjoining ſkin before it was permitted to heal. By theſe practices, varied according to the circumſtances, this ſtrange diſeaſe was entirely cured; it had continued two years and nine months; but by perſevering in this plan, eſpecially in reſpect of the ſcarification, (which was indeed a daily and ſevere operation), he recovered perfectly in ſix weeks. Even the dark colour of the ſkin almoſt diſappeared, and it became ſoft, pliable, and clean.

Excepting ſuch ulcers as theſe which I have deſcribed, none, I believe, are entirely local; every great ulcerated wound becomes ſo from a fault in the conſtitution, not from the ill diſpoſition of the particular part. This at leaſt is the caſe in every dangerous ulcer; and this obſervation very naturally occurs to me, when I proceed, next, to ſpeak of the Hospital Sore, which I would not regard as a mere ulcer, to be treated like other common ulcers, but as a general affection of the ſyſtem, a mortal diſeaſe; for when it rages in a great hoſpital it is like a plague; few who are ſeized with it can eſcape.

There is no hoſpital, however ſmall, airy, or well regulated, where this epidemic ulcer is not to be found at times; and then no operation dare be performed! every cure ſtands ſtill! every wound becomes a ſore, and every ſore is apt to run into gangrene: but in great hoſpitals eſpecially, it prevails at all times, and is a real gangrene; it has been named the Hoſpital Gangrene; and ſuch were its ravages in the Hotel Dieu of Paris (that great ſtorehouſe of corruption and diſeaſe), that the ſurgeons did not dare to call it by its true name; they called it the rottenneſs, foulneſs, ſloughing of the ſore! the word, hoſpital gangrene, they durſt not pronounce! for it ſounded like a death-bell *; at the hearing of that ominous word, the patients gave themſelves up for loſt. In the Hotel Dieu this gangrene raged without intermiſſion for two hundred years, till, of late, under the new government of France, the hoſpital has been reformed. "A young ſurgeon (ſays an ancient French author) who is bred in the Hotel Dieu, may learn the various forms of inciſions, operations too, and the manner of dreſſing wounds; but the way of curing wounds he cannot learn. Every patient he takes in hand (do what he will) muſt die of gangrene." Nothing, perhaps, will contribute ſo much to your underſtanding this diſeaſe, as a plain deſcription of it in the form of an individual caſe.

Joiner, a boy belonging to the Triumph, whoſe ulcer I have drawn, received but a very ſlight and ſuperficial wound, and for ſome time after the battle he continued in health, and the wound healed rapidly. But while it was to all appearance florid and healthy, with no threatening of ulceration, the boy in full ſpirits and ſtrength, walking about on crutches, guilty of no irregularity, it began to look ill; a ſure preſage of ſome change of health.

There came on a cough, with ſymptoms of a common cold, which he imputed to his bed being placed near a door, lately open and now ſhut, but not walled up; then his health failed, his ſpirits became quite oppreſſed; he had occaſional attacks of fever, frequent vomiting, and a continual loathing of food. With theſe ſlight and ſeemingly unimportant ſymptoms (but the tendency of

* La Motte ſays, "Mortification ce qu'on appelle POURITEUR a L'Hotel Dieu de Paris, laquelle ſurvient et accompagne preſque toutes les playes qui ſont traitté dans cette hoſpital," p. 330. And the diſeaſe was not named, "dans le crainte d' inquieter ces bleſſez qui croiroient etre perdue des que l'on appelleroit cet pourriture, GANGRENE."

JBell del.

JGrant sc.

JOINER.

A BOY of the TRIUMPH.

ſuch ſymptoms when they appear in a foul hoſpital is eaſily underſtood), his ſore, which was no bigger than the palm of the hand, became in two days as big as the crown of a hat, in one week it grew as large as repreſented in the drawing. The whole ſkin of the thigh was deſtroyed, the muſcles were ſtripped of ſkin and faſcia from the hip to the knee, the trochanter was almoſt laid bare, the hamſtring muſcles expoſed to a conſiderable extent, and all the muſcles of the thigh diſſected in a manner which no drawing can expreſs.

While theſe ulcers made their dreadful progreſs in any of the wounded, I could obſerve them paſs through the ſeveral ſtages, firſt of inflammation, then of inſenſibility and gangrene, and then of renewed pain and ſenſibility. Firſt, when the health is affected, the patient languiſhes for a few days, and the ſore inflames; then come vomitings, diarrhœa, and a diſtinct fever, and the diſeaſe ſeizes plainly upon the wounded part. In its firſt ſtage the wound ſwells, the ſkin retracts, waſtes, has a dark eryſipelatous redneſs verging to black, the cellular membrane is melted down into a fœtid mucus, and the faſcia is expoſed. But in the ſecond ſtage, the faſcia and ſkin unable to bear their inflammation, and deprived of mutual ſupport, become black, fœtid, ſoft, and fall into perfect gangrene; yet there are no veſicles, and the mortification is confined within the cavity of the ſore. This is the ſtage of inſenſibility; the parts within are covered and defended with a perfect ſlough, which no medicine can penetrate, on which no applications can make any impreſſion; and ſtimulants are uſed, without pain, of ſuch a hot and fiery nature, as none but dead parts could reſiſt: But when theſe ſloughs open in the natural courſe of the diſeaſe, and the living parts are expoſed, and the medicines begin to make an impreſſion, it is imagined that theſe applications are reſtoring life and energy to parts which, before they were applied, ſeemed entirely dead! It is under this impreſſion, that ſtimulants are continued of a ſtrength which parts thus inflamed cannot bear; the diſeaſe is aggravated by them, and the cries from all ſides are ſuch as would melt the moſt rugged nature.

In the third ſtage, this gangrene ceaſes, the ſloughs fall off, the muſcles become expoſed, the part aſſumes once more the appearance of a common ſore, but fearfully enlarged; a high and gloſſy red, and a ſmooth, ſhining, uninterrupted ſurface, mark the continuance of the inflammation and diſeaſe; but if the ſores are to do well, it is known by a rough, granulating, ſurface, ſomewhat dry, and of a paler colour.

If the patient is to die, the gangrene or waſting of the cellular ſheaths proceeds; the ſkin firſt ſloughs off; then the faſcia is deſtroyed; thoſe diviſions and lamellæ of the faſcia, which dive betwixt the muſcles to encloſe, protect, and nouriſh them, are next affected; the matter continues ſlimy and thick, and in prodigious quantities; the muſcles are divided from each other more and more. In many who ſuffered under the diſeaſe at the ſame time with Joiner (the boy above mentioned), you could have laid your hand edgeways betwixt the ſeveral muſcles of the thigh. Then the vomiting, diarrhœa, and nervous ſymptoms increaſe, the pain is dreadful; the cries of the ſufferers are the ſame in the night as in the day-time; they are exhauſted in the courſe of a week, and die: or if they ſurvive, and the ulcers continue to eat down and disjoin the muſcles, the great veſſels are at laſt expoſed and eroded, and they bleed to death. Thus a lad of the name of Handling, who had at the firſt but a ſlight wound in the thigh, had the cellular membrane, in the courſe of a few days ſo deſtroyed, that you could put your clenched fiſt into the hip, and could lay the hand ſideways betwixt any two muſcles of the thigh. You could have counted each muſcle, as in a diſſection, from the tuber iſchii to the ham. The branches of the Profunda Femoris firſt gave way, then the Sciatic veſſels; for three nights he loſt two or three pounds of blood each night; it would have been almoſt cruel to ſtop the hæmorrhagy, had it been poſſible, ſo very deſperate was his ſituation; on the fourth day he died. I hope and believe that theſe ſcenes have made a laſting impreſſion on the few who witneſſed them.

Theſe are the forms which this diſeaſe aſſumes when it attacks an amputated ſtump, a broad and open wound, a laceration of the ſkin, or any ſurface which is apt to become a flat ſore. But when it attacks a narrow wound, as a bullet wound, a wound with any pointed inſtrument, even the prick of a nail in the finger, it aſſumes at once the form of an Eryſipelatous Gangrene (Eryſipelas Gangrenoſa); and when this diſeaſe prevails in the hoſpital, you may ſee even a NURSE, from ſome ſlight hurt in the hand, which at another time could have done no harm, have one day a ſwelling of the wound, on the next an eryſipelas of the arm, with dreadful pain and low fever; on the third day the arm will become livid, and covered with veſicles, and in two days more fall into gangrene; the woman oppreſſed in the mean while with hiccup, low delirium, and other ſymptoms of approaching death.

The wounds which are moſt apt to be ſeized with this hoſpital gangrene,

are thoſe which are flat and open, becauſe in them much of the ſkin has been torn away. Tucker, a boy alſo belonging to the Triumph, who lay in the bed next to Joiner, had like him received a ſuperficial and open wound, or a ſcratch rather, upon the loins from a ſplinter of wood. This dreadful infection ſeized alſo upon his wound, and the ulcer extended over the loins, over both buttocks, and part of both thighs; he could lie only on his belly, and, like Joiner, cried in a moſt lamentable manner. A flap of ſkin torn down by ſplinters from the arm or thigh is ſure to run into this kind of gangrene. James Buck, a ſailor, was wounded with a ſplinter of wood, which tore away a flap of ſkin from the fore part of the thigh, cutting it as clean as if it had been done by the ſurgical knife. Two ſmall arteries required to be tied, a veinous oozing from the lacerated Saphena vein continued for two days; but this ceaſed, his wound contracted faſt; he was able to go upon crutches, and was allowed to indulge himſelf abroad. You know well that a ſailor's indulgences, after long confinement, are of a coarſe kind for a ſick man. We found that he had been often drunk, was frequently revelling all night in the ſtreets, and when day light approached he ſcrambled over the hoſpital wall, or through the ditch full of mud *. Frequent debauches, and the cold of winter, expoſed him to the infection of the houſe; he was weakened, fell ſick, the hoſpital ſore ſpread over his thigh to a moſt dreadful degree; but wine and opiates, and careful living, brought him right again; and he was one of the few who had a proſpect, when I left him, of recovering from the diſeaſe.

Attwood, a corporal of marines, was wounded by a great ſplinter of wood, which ſtruck him in the arm, ſo obliquely, that without breaking the bone, hurting the muſcles, or wounding any great veſſel, it tore down a long flap of ſkin, from the top of the arm to the elbow, it was not ruffled and furled up, but left adhering only by its lower end, and ſeparated ſo clean, that it hung from the elbow like a flat ſtrap of leather, and there could be no doubt about cutting it away. Such a wound is, by a judicious ſurgeon, ſent into an hoſpital with great reluctance; the man is a ſure victim to the hoſpital gangrene; he goes like a ſheep

* At Yarmouth, as in other military hoſpitals, when they wanted to ſteal out and get drunk, they had two general methods, the wet and the dry; the wet when they went through the ditch, and the dry when they burrowed through the ſand, and ſo got under the palliſado. In the Yarmouth hoſpital centries were placed, one to guard the holes, and another to guard the ditch; however he had the moſt difficult duty who watched the ditch, for nothing of them but their heads were above the mud; and unleſs he heard them puddling and ſnuffling, he had no chance of preventing the enterpriſe. Theſe were the men wounded in the Dutch and Engliſh fleets on the 11th of October 1798.

to the ſlaughter. Yet, for a month nearly, this wound did well; when the man, beginning to find himſelf too well, got abroad, was drunk every night, and rioting in the ſtreets, and was expoſed during intoxication to extreme cold, two depreſſing powers, which, in a particular manner, ſubject the ſyſtem to the hoſpital gangrene. It may eaſily be imagined, that a man living in this idle way uſed many dangerous freedoms with his arm, ſo that it was very ready to inflame as ſoon as his general ſyſtem began to fail. The hoſpital ſore is uſually preceded by a degree of fever; the health languiſhes, the appetite decreaſes, the patient rejects his food, the tongue becomes very foul, with thirſt, and a ſmall, weak, quick pulſe: there is a latent fever, or tendency to fever, and very generally a diarrhœa enſues. Attwood being ſeized with theſe ſymptoms, his arm ſwelled, the edges of the wound roſe much above the level, the whole ſkin became black, and ſloughed off in flakes, the faſcia fell off together with the ſkin, the muſcles waſted ſo in a few days that nothing was left but the bone, covered, as it were, with a ſort of moſs, or efflorescence, of clear, red granulations; the one half of the arm is now loſt; and though the ulcer ſhould be cured, which I queſtion very much, the arm will be uſeleſs for life.

Thus we find ſuperficial ulcers, ſplinter wounds, the flat ſurfaces of ſtumps, or any open ſurface, the moſt apt to be ſeized with the hoſpital gangrene; but when the diſeaſe rages, nothing can reſiſt it. One of the ugliеſt ulcers among thoſe who ſurvived the diſeaſe, proceeded from a penetrating wound. It was in one Sherridan, a ſeaman of the Belliqueux. There was in the wound of his arm, unqueſtionably, no ball nor ſplinter of ſhot, and therefore there was every reaſon to believe the wound to have been made by the point of ſome long ſhaft-like ſplinter, which had immediately dropped out again. The wound was on the outſide and middle of the arm, ſomewhat ragged, and very deep, as if the ſplinter had paſſed by the ſide of the bone. Mr. Hill, the ſurgeon of his ſhip, held a conſultation upon the caſe with Mr. Broomly of the Monmouth; for though the arm was not greatly ſwelled, yet the wound was exceedingly narrow, the probe paſſed inwards to a great depth, and there ſeemed danger of a collection of matter. The opening of the wound was very narrow, the circle of it very red and turgid, the matter ſanious, and the arm, though not much ſwelled, was in great pain. The wound was, very properly, dilated; but as the ſplinter had almoſt transfixed the arm, perhaps it would have been more fortunate if the probe had been introduced, and cut upon, a counter open-

ing made, and a ſeton paſſed through that counter opening; and this, if to be done at all, ſhould have been done at the firſt; for in men who are to be thrown into a foul hoſpital, inciſions are particularly apt to go wrong; and I think I have obſerved, that the ſtimulus of a ſeton, together with the ſmallneſs of the opening which the ſeton requires, keeps the wound in better condition than the dilating it with the knife. While this man remained at ſick-quarters (i. e. at country lodgings), his arm healed, and it even continued well for ſome time after he was brought into the hoſpital; but it was not long before he loſt his health, the ſore inflamed, and in a few days the hoſpital gangrene carried away all the ſkin and muſcles, from the ſhoulder down to the bellies of the ſupinator muſcles; the fore-arm, eſpecially at the elbow, ſwelled; the arm waſted, and the fleſh was ſo deſtroyed by this horrible ulcer, that when the ſloughing was over, nothing ſeemed to be left of the arm except the bone, covered with a velvet-like ſurface of ſhining red fleſh, like that repreſented in Joiner's hip.

A ſtump which has not adhered is a flat wound, peculiarly apt to be ſeized with this dreadful diſorder; and in wards where the diſeaſe prevails, amputation ſhould not be performed. It is almoſt impoſſible to heal the ſtump; it ſloughs, ulcerates, ſhrinks, becomes pyramidal; and to the very laſt moment of its healing, and even when the ſcar ſeems formed, or is about to be formed, the patient is liable to rigors, ſlight vomiting, a quick and irritable pulſe; and then, in the courſe of a few days, the ſtump is burſt open by inflammation, and ſpreads itſelf into a broader ſurface than even when the limb was cut off. In one day I ſaw three ſtumps burſt open in this manner, each of which was ſo nearly cicatrized, that you could have covered the ſmall ſpot that was left unhealed with the tip of the little finger. One of the men to whom this happened was Thomas Crouch, whoſe ſtump is drawn, in the Chapter on Diſeaſed Stumps. His arm was ſtruck by a great ſhot, and left hanging by one rag of fleſh; the bone was ſadly ſhattered; the rag of fleſh which held the arm was cut off; the ſurgeon thruſt his finger into the hollow of the maſhed and lacerated ſtump, and the bone was found to be ſplit and ſhattered a conſiderable way up. The arm was amputated three or four inches above the wound; and it was cured in ſix weeks; not the breadth of a ſixpence being left unhealed. He had been often ſeen in the ſtreets drunk: by ſuch irregularities he had ſo debilitated his ſyſtem, as to expoſe himſelf to the hoſpital ſore; his ſtump gradually opened wider and wider; the fleſh ſhrunk from the bone, the bone lay uncovered

in the hollow of the ſtump, and began to exfoliate. The drawing is taken at the time of the ſore's being expanded to a ſurface much broader than at firſt, becauſe now, in addition to the natural ſize of the parts, the whole circle or border of the ſtump was greatly inflamed and ſwelled. The danger of this inflammation and ulcer of the ſtump is extreme; the leaſt evil that can enſue from it, is a great waſting of ſubſtance, an exfoliation of the bone, and a conical ſtump: but we are often diſappointed even of this imperfect cure, viz. in the form of a conical ſtump; for it happens in an ulcerating ſtump, as in other ſores, that the greater arteries are eroded, and then the patient almoſt inevitably dies.

This you perceive, Gentlemen, is a very dreadful diſeaſe; it is indeed a ſtudy in itſelf; and therefore the obſervations I have here to lay before you muſt be very limited.

We have no reaſon to conſider this as a local diſeaſe, nor can almoſt any ulcer be conſidered as entirely local. We ſee parts injured in every poſſible way; yet no injury of the parts produces a permanent ſore; we ſee parts ruined in their texture by contuſion of machinery, or by ſtones, beams of wood, &c. falling upon them; we ſee parts entirely killed by the contuſion of ſhot; we ſee them irritated by ſpoiled bones and balls, and ſplinters buried in the fleſh; we ſee wounds teazed with tents, cauſtics, catheretics, or corroſive and irritating medicines, without ulcer being produced; we may do what we will to the part, without producing ulcer, if we hurt the part only. While there is no prediſpoſition or general diſeaſe our greateſt imprudencies produce but ſuperficial ſores, the fartheſt from the nature of ulcers; there is, on the contrary, when parts are irritated and vexed (at leaſt in a healthy conſtitution), a perpetual reſiſtance and tendency to heal; nay, when it becomes our duty to eſtabliſh a diſcharge, a perpetual ulcer can hardly be maintained; it is done with difficulty, even by beggars and gypſies, more cunning in this reſpect than ſurgeons. Excepting that habitual ulcer which ariſes from the dependent poſture of the lower extremity, all ulcers, great and ſmall, have their cauſe in the general conſtitution, not in the part; it were, perhaps, out of place to add here, that all great inflammations are founded in weakneſs; for I am now ſpeaking rather of the effects of inflammation, viz. ulcer and gangrene; than of inflammation itſelf. Inflammation itſelf may or may not conſiſt in debility; but it is ſurely from debility, or exhauſted excitability, that a part ſinks under the diſeaſe; for if, in the caſe of a wound, the ſyſtem or the part have ſufficient ſtrength to ſupport the action, the part will ſuppurate, granulate, and heal;

but if the ſyſtem be irritable and weak in an extreme degree, the part is quickly exhauſted of its excitability; it is no longer able to bear the action; the inflammation overpowers it, and it ſinks under the diſeaſe.

There are various ways in which the excitability of an inflamed part may be thus ſuddenly exhauſted, ſo that it ſhall fall into ulcer or gangrene. When, for example, the actions of a part are long ſuſpended by cold, moderate heat is a ſtimulus too high for it to bear; the parts, upon being heated, ſeem to fall into immediate gangrene, preceded by a ſtate of inflammation, too ſhort and tranſient, indeed, to be much obſerved; yet I never knew a froſt-bitten limb fall into gangrene without previous inflammation and great pain. The wound may be a poiſoned wound, of a nature ſuch as to exhauſt the part in a moment; and yet in this caſe, though the part does grow very ſuddenly black, there is a moment of high excitement, and excruciating pain. The ſyſtem, alſo, may have laboured long under a ſtate of habitual weakneſs, ſo as eaſily to loſe its remaining excitability; and accordingly, when we make punctures in a dropſical leg, they hardly inflame before they fall into gangrene; and a man who is hurt in the ſpinal marrow, if he has a wound at the ſame time in the lower extremities, immediately ſuffers a low and livid inflammation in the part, which falls preſently into a gangrenous ſore. A man may be healthy when he receives a wound, and the ſyſtem being full of vigour, the parts may be able to ſupport their inflammation; but the moment that he loſes his health, the excitability of the part is liable to be borne down by that degree of inflammation which it ſuſtained while the ſyſtem was healthy, but which it is now no longer able to ſupport. The parts ſink under the action; that action is no more violent than it was at firſt, but the part is leſs able to endure it; and thus, as ſoon as any new ſickneſs ſhows itſelf, and eſpecially when the ſyſtem is attacked with this hoſpital fever, the wound becomes livid and gangrenous, and takes the appearance of a gangrene from cold, of a poiſoned wound, or of that kind of gangrenous ulcer which is produced by ſcarifications, or ſlight wounds in a dropſical or paralytic limb.

Theſe are the conſequences, not of that infection only which we call the Hoſpital Gangrene, but of every debilitating cauſe. Drunkenneſs and debauchery, ſtomach complaints, vomiting, diarrhœa, low ſpirits, the return of an old intermittent fever, the infection of dyſentery, any debilitating cauſe, will produce a change in the appearance of a wound. But this infection of the hoſ-

pital is the moſt irreſiſtible of all. The moment that a man is ſtruck with it, you may obſerve him become pale, ſallow, languid, low-ſpirited, with a heavy eye, a confuſed head, a loathing of food, a fretful pulſe, and, in ſhort, a univerſal diſorder, which he can neither account for nor deſcribe; and whether this diſeaſe appear firſt in the ſyſtem, or in the part wounded, its progreſs is the ſame. When I have obſerved in any caſe the ſore to be firſt affected, I have noted it as a ſure ſymptom of the approaching diſorder of the whole ſyſtem; or when the ſyſtem was firſt affected, I have marked that as a ſure preſage of the ſad change that was ſoon to appear in the ſore. He muſt, indeed, be very ignorant who diſputes this hoſpital ſore's being a general diſeaſe of the ſyſtem; he muſt have obſerved very little, who does not know it to be abſolutely an infection. To what other cauſe can it be aſcribed? To a ſcorbutic and bad habit of body? Surely not; for the boys of the ſhip, who run about continually, and from their ſpirits and exerciſe are always in health, are the firſt affected with hoſpital ſore: but thoſe chiefly ſubject to the ſcurvy, are the landſmen, who are unhappy in a ſea life, impreſſed men who have been torn from their friends, or lazy ſkulkers, who never move but to the ſound of the boatſwain's whiſtle. Neither can we attribute it to the unhealthy ſtate of the crew of a particular ſhip; for the wounded of ſuch ſhip are unavoidably diſperſed; ſome are at ſick-quarters, and they get well; ſome are carried into the hoſpital, and they become diſeaſed; and ſometimes, when thoſe hoſpital patients are carried out again to ſick-quarters, they recover their former health. Thus we ſee this diſeaſe confined within the walls of an hoſpital; nor does it always extend farther than a ſingle ward. In Yarmouth, the Engliſh ſeamen who were wounded on the 11th October were divided from three hundred wounded men of the Dutch by a wall only; the great wards were on the oppoſite ſides of the partition under one roof; on the one ſide of that partition we operated on men and boys, opened ſinuſes, or ſearched for balls or pieces of ſhot, as freely as in the moſt healthy hoſpital, or in ſick-quarters; not a ſore was to be ſeen there, except ſuch as were the inevitable conſequence of gunſhot wounds, with carious bones. But on the other ſide of the partition-wall were ſuch ſores as are ſeldom to be ſeen, prohibiting all operations even the moſt trivial.

Indeed, from all that I ever could obſerve, the vulgar expreſſion of the tainted air of an hoſpital, is not incorrect. This ulcer and gangrene is, in an hoſpital of wounded men, what puerperal fever is in a lying-in ward; it is an infection to

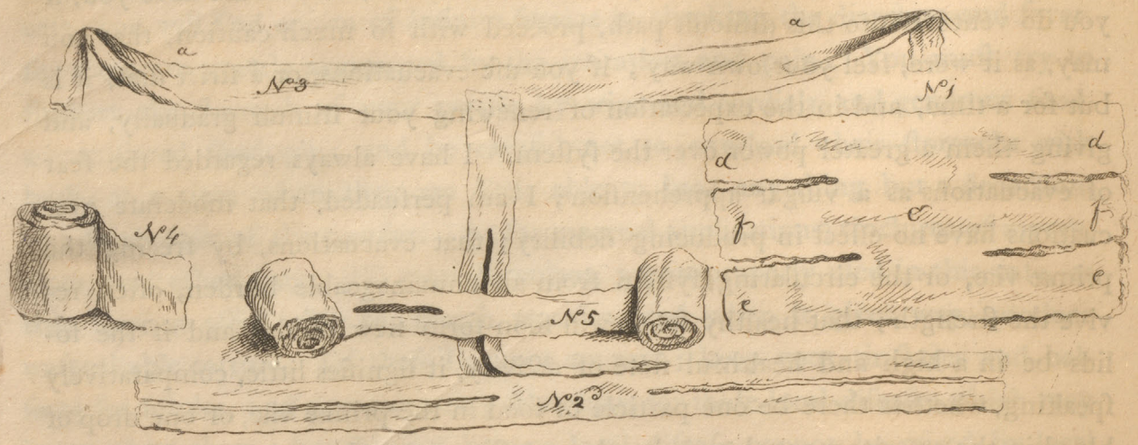
which all are equally expoſed; but it is reſiſted by health and ſtrength, and favoured by weakneſs or diſeaſe. Exceſſes, drunkenneſſes, cold, and every cauſe of weakneſs, expoſe the conſtitution to its attack. If diarrhœa, fever, dyſentery, or an old intermittent, or even a common cold, attack a wounded man who lies in an unhealthy hoſpital, the firſt febrile ſymptoms are immediately followed by this terrible diſeaſe. Though we often miſtake theſe debilitating powers for principal, I ſuſpect that they are but prediſpoſing cauſes, and that the diſeaſe of the hoſpital, like a peculiar typhus, or the ulcerated ſore throat, is ſtill the ſame. What, then, is the ſurgeon to do? Is he to try experiments with ointments and plaſters, while men are dying around him? Is he to ſeek for waſhes or dreſſings to cure ſuch a diſeaſe as this? Is he to expend butts of wine, contending, as it were, againſt the elements? No! Let him bear this always in mind, that no dreſſings have ever been found to ſtop this ulcer; that no quantities of wine or bark which a man can bear, have ever retarded this gangrene; let him bear in mind, that this is a hoſpital diſeaſe; that without the circle of the infected walls the men are ſafe; let him, therefore, hurry them out of this houſe of death; let him change the wards, let him take poſſeſſion of ſome empty houſe, and ſo carry his patients into good air; let him lay them in a ſchool-room, a church, on a dunghill, or in a ſtable (like Paree's gangrened ſoldier), let him carry them anywhere but to their graves. No expence ſhould be ſpared; for theſe are men who have entitled themſelves to care, by every claim which men can have; and no one will dare to check the ſurgeon in theſe his moſt important duties. You are not ſent out with only the amputation-knife in your hands; you are appointed to ſave the lives of your ſailors or ſoldiers by all poſſible means: You are to conduct yourſelves not like mere mechanical ſurgeons, like men capable only of doing over again what they have ſeen or heard deſcribed in ſchools, nor like men without ſenſe, reflection, prudence, or thoſe free and manly conceptions which your diſtinguiſhed ſituation and new and various duties require: You would willingly expend your own fortune in ſuch a cauſe,—then do not grudge to employ the revenue of the ſtate, for it is employing and not abuſing it! this is not profuſion, but the wiſeſt and beſt economy: if in the courſe of a few weeks ſixty men die of the diſeaſe in your hoſpital, government has loſt a ſum which would trebly buy your hoſpital itſelf! The groſs value of ſo many men in money, as they are reckoned on the muſter books, being full fifteen thouſand pounds.

Till ſome change of ſituation be accompliſhed, little can be done for men labouring under this plague; but when the diſeaſe firſt breaks out and rages, and while you are meditating ſome change, or concerting plans for ſuppreſſing the diſeaſe, you will find opium of infinite ſervice in checking the diarrhœa and fever, for theſe are greatly aggravated by the irritation and pain: You muſt try to ſupport the ſtrength of your people by wine and cordials, and generous food, adminiſtered ſparingly; and be careful not to overload their ſtomachs with bark, at a time when they are little able to bear any thing but a decoction, or a ſmall doſe of the powder. As for external applications, tinctures of myrrh, aloes, and other drugs, ſtill more ſtimulant, are improperly uſed in this caſe, as they have no effect while the ſlough remains, and when it gives way, produce unſpeakable torture. Of theſe I cannot approve; keep your tinctures and balſams for fiſtulas, and your torturing ſtimulants for thoſe local diſeaſes which may be cured by them; but this not being a local diſeaſe cannot be cured by local applications, and therefore the mildeſt are the beſt; as, for inſtance, a ſolution of ſal-ſaturni, which is a gentle aſtringent.

The hoſpital ſore is a general diſeaſe in which your whole attention is to be directed to the ſtate of the ſyſtem, and that is ſuch as will not be eaſily ſet to rights. But there is one general fact which is very intereſting: we cannot but obſerve how much and how ſuddenly the powers of the living ſyſtem riſe after being depreſſed; we cannot but remark how after a ſhort fever the ſyſtem acts with uncommon vigour, how every diſeaſe diſappears before the fever, and how the patient thrives after it is gone. We alſo ſee plainly the moſt wonderful effects, from that tumult of the ſyſtem which is produced by hyoſciamus, belladona, digitalis, cicuta, mercury, and other violent drugs. Even a violent vomit excites the abſorbents, and ſets the whole ſyſtem to work. Surely it muſt be from plunging the ſyſtem into a ſudden ſtate of debility that it regains its elaſticity (if I may expreſs it ſo), or recovers its ſuſceptibility with regard to the ordinary powers of life: I know of no other way by which we can account for the ſingularly good effect of evacuations in many diſeaſes. It is on this ground that in the beginning of all fevers I ſtill approve the old practice of vomits, purges, and abſtinence, by which I often ſee the ſyſtem recovered from its oppreſſion, and reſtored to that freedom of action, and that aptitude for ſtimuli, upon which much of the cure depends, and by which the ſyſtem is prepared, as it were, for the action of thoſe powers, as opium, bark, wine, and mild, but nouriſhing diet, upon

which we are to truſt to for accompliſhing the cure. I think that in this hoſpital ulcer I have ſeen ſuch practice uſeful; but I am ſo undecided with regard to the true practice in this diſeaſe, that I ſpeak with diffidence, and would have you, if you do venture into this difficult path, proceed with ſo much caution, that you may, as it were, feel your own way; if you uſe evacuations, or a ſtrict diet, it is but for a time, and in the expectation of renewing your ſtimuli gradually, and giving them a greater power over the ſyſtem. I have always regarded the fear of evacuations as a vulgar apprehenſion; I am perſuaded, that moderate evacuations have no effect in producing debility; that evacuations, by freeing the primæ viæ, or the circulating ſyſtem from an unmanageable burden, often revive the ſtrength; that healthy ſolids will ſoon form new fluids; and if the ſolids be in a high and healthful ſtate of activity, it ſignifies little, comparatively ſpeaking, whether there be one particle of food in the primæ viæ, or one drop of blood in the arteries more than is barely neceſſary to preſerve them in action.

I began this diſcourſe with the deſign of explaining to you only in a very general way the ordinary duties of a ſurgeon: and if I have been induced to ſpeak more fully on ſome intereſting points too little regarded in the common books of ſurgery; it is becauſe in theſe duties there is more uſefulneſs than ſhow; they are daily cares more honourable in my mind than bloody inciſions! Perhaps, the ſoreſt reproach againſt the authors of ſuch books would be to ſay, that they have not underſtood thoſe duties; but ſurely the greateſt misfortune that could befal you, as young men, would be the learning to neglect them. If the directions which I have laid down ſhould enable you to go your rounds in the hoſpital with a quicker eye, and clearer underſtanding of the caſes that are committed to your care; and a more perfect command of the ordinary remedies, I ſhall be very highly gratified: and if you can once bring yourſelves to like a diſcourſe on ſuch ordinary concerns as theſe, better than one which is more argumentative or learned, I ſhall think it the ſtrongeſt proof of your good ſenſe, and the moſt perfect aſſurance that you will become good and uſeful ſurgeons.




# DISCOURSE IV.

## ON BANDAGES.

IN my laſt diſcourſe, Gentlemen, I ventured to ſay, " That while we are improved in the great points of ſurgery, we are gone backwards in all thoſe nice and delicate attentions, on which ſo much depends in the cure of wounds." And while ſpeaking of ſuppurations and fiſtulas, and the lax ſwelling of a wounded or broken limb, you could not but obſerve that I noticed many uſes of bandage which you muſt have lamented to find ſo imperfectly explained in books. Theſe things, however, ſhould not be neglected; they are leaſt of all to be neglected by one who thinks an attention to the common and humble duties of the profeſſion more commendable, more becoming, more like good ſenſe and ſound judgment, than a paſſion for bloody operations and extraordinary cures.

With the deſign of this diſcourſe, you are therefore already in ſome degree acquainted; and I truſt, that I ſhall prove the ſubject to be particularly worthy of your attention; for a bandage is not merely uſeful in tying up a wound, but in accompliſhing many important operations in ſurgery, more intereſting, indeed, than thoſe

which are done with the knife. In wounds, in abſceſs, in fiſtulas, in any general diſeaſe of a limb, bandaging is the chief operation of ſurgery; what the knife cures, it partly deſtroys; what the bandage cures, it ſaves.

1ſt, Although in recent wounds, it is with plaſters and ſutures that we unite the parts point to point, yet it is with the bandage that we ſupport the limb, preſerve the parts in continual and perfect contact with each other, and prevent any ſtrain upon the ſutures with which the parts are immediately joined, and we often unite parts by the bandage alone. The Uniting Bandage has been long known by that name. But it is particularly to be obſerved, that in gunſhot wounds, and other bruiſed wounds, though it would be imprudent to ſew the parts, ſince it is impoſſible that they ſhould altogether unite, yet the gentle and general ſupport which we give by a compreſs and bandage, prevents them from ſeparating far from each other, unites the deep parts early, and leſſens the extent of that ſurface which muſt naturally fall into ſuppuration.

2dly, Although in the hæmorrhagy of amputation, or in any regular piece of ſurgery, we truſt to the needle alone; in the hæmorrhagy of wounds, we cannot always find the artery; we dare not always cut the parts, for fear of greater dangers; we are often alarmed with bleedings from uncertain veſſels, or from members of veſſels, or from veins as well as arteries: theſe are hæmorrhagies to be ſuppreſſed by the compreſs, which compreſs, or (even the ſponge itſelf), is but an inſtrument of compreſſion, ſerving to give the bandage its perfect effect. Frequently, in bleedings near the groin, or the arm-pit, in the angle of the jaw, wherever the bleeding is rapid, the veſſels uncertain, the cavity deep, and the blood not to be commanded by a tourniquet, and where the circumſtances forbid a deliberate and ſure operation, we truſt to compreſs and bandage alone.

Bandage is very powerful in ſuppreſſing bleeding. At one period of ſurgery it took place of every other method; and that was not in times of ignorance, but long after the diſcovery of the needle; not among unſkilful men only, but among the beſt ſurgeons in France; or in other words, this was practiſed very frequently by the beſt ſurgeons in the world, not only in the times of good ſurgery, but by the very men who made ſurgery what it is. If a compreſs be neatly put upon the bleeding arteries, if there be a bone to reſiſt the compreſs, or even if the ſoft parts be firm below, and the bandage be well rolled, the patient is almoſt ſecure. But ſuch a roller muſt be rolled ſmoothly from the very extremity of the fingers or toes; the member muſt be thoroughly ſupported in

all its lower parts, that it may bear the preſſure above. It is partial ſtricture only that does harm, creates intolerable pain and anxiety, or brings on gangrene. Hæmorrhagy requires a very powerful compreſſion, which muſt therefore be very general, and muſt be made very cunningly and ſkilfully, to be either ſupportable or ſafe; it muſt not be made only over the bleeding arteries, which is all that the ſurgeon thinks of in general, nor muſt it be begun at that part where it is particularly required; the bandaging, for example, by which a wounded artery at the bending of the fore-arm may be cured, muſt be begun at the very tips of the fingers; each individual finger muſt be rolled; the roller muſt be continued over the hand, with the greateſt attention to leave not a ſingle point unſupported, nor ſubject to ſtrangulation. It muſt be rolled carefully and firmly upwards along the fore-arm; and thus the whole of the limb will be ſupported againſt that preſſure which is made, particularly upon the wounded part. When thus rightly applied, the firmer the bandage is, the leſs apt it is to be attended with pain or danger. Gangrene is, you may eaſily perceive, the effect, not of a firm bandage becauſe it is firm, but becauſe it is partial, and ſtrangles ſome ſingle point of the limb.

From theſe conſiderations, we underſtand why ſurgeons failed in the cure of aneuriſms, notwithſtanding their curious contrivances of plates, and ſcrews, and ſprings, and cuſhions; they were too curious, all their care was to make the preſſure upon ſome ſingle point of the limb; and all the fault of their inſtruments was this partial preſſure. We alſo perceive how a beggar is able by the help of a roller merely, to waſte his limb, and ſqueeze together the very bones *. We know, that by a compreſs and bandage thus applied, we can with certainty not only ſtop a bleeding artery, as was often done by the older ſurgeons, by lay-

* The proof that theſe villains make their ulcers, and deſtroy their limbs, by ſecret methods of their own, is, that no ſurgeon ever ſaw ſuch diſeaſes except in beggars; nor is he well able to explain how ſuch diſeaſes, ulcers, diſtortions, and ſwellings are produced; he could not, all at once, promiſe to make thoſe diſeaſes which they produce with very little ſuffering. The ſurgeon himſelf, though well ſkilled in his profeſſion, would need to ſtudy how to ſwell the joints, waſte the bones, blow up the parts, as the ſcrotum, or knee, or head, with wind, how to produce perpetual ulcers of all horrible forms, how to deſtroy the limbs by compreſſion, how to produce ſore eyes, perpetual vomitings of blood, paſſing of ſtones from the urethra, enormous flatulent ſwellings of the ſtomach. Theſe, and all kinds of diſeaſes (except ſerious or diſtreſſing ones), beggars know how to produce; and this hereditary craft of the gipſy tribe, is not quite unworthy the attention of medical men.

ing a compreſs within the wound, but we may even obliterate the canal of an artery, by a compreſs laid upon the outſide of the limb.

3dly, In ABSCESSES, where matter is working downwards along the limb (ſeeking out, as it were, the weak parts), undermining the ſkin and waſting it, inſulating and ſurrounding the muſcles, and penetrating to the bones, the bandage does every thing *. The expelling bandage, the propelling bandage, the defenſive bandage, were among the names which the older ſurgeons gave to the roller when it was applied for theſe particular purpoſes; and theſe are properties of the roller which ſhould not be forgotten. It is obvious, that of all bandages the ſimple roller is the beſt fitted for a diſeaſed limb; but the moment you begin to apply this ſimple bandage, you will meet with unexpected difficulties; you will feel the neceſſity of uſe and practice towards rolling a limb with neatneſs and perfect effect; you will find yourſelves awkward at firſt, and would almoſt believe, that a ſimple roller could never be made a perfect ſupport to a diſeaſed joint; you will perceive your bandages to be irregular from the firſt, and they will be ſlackened in a few hours. Practice will convince you, that the firmneſs and neatneſs of a bandage depends altogether upon theſe two points, firſt, upon the TURNS ſucceeding each other in a regular proportion; and, ſecondly, upon making REVERSES, wherever you find any ſlackneſs likely to ariſe, from the varying form of the limb. Thus, in rolling from the foot to the ancle, leg and knee, you muſt take care, firſt, that the turns, or, as the French call them, Dolloires, of the roller † lie over one another by juſt one third of the breadth of the bandage; and, ſecondly, that at every difficult part, as over a joint, you turn the roller in your hand, make an angle, and lay the roller upon the limb with the oppoſite flat ſide towards it; you muſt turn the bandage ſo as to reverſe it, making what the French call a Renverſée of the roller, at the ancle, at the calf of the leg, at the knee ‡; wherever, upon making a turn of the roller, you perceive that it will fall ſlack, you make a REVERSE of the bandage, and at each reverſe you put in a pin to prevent it falling down; you muſt be careful to roll your bandage from below upwards, and ſupport the whole limb by a general preſſure, that you may be able to

* The ancient ſurgeons knew more of this than the moderns. In the preface to the treatiſe of Galen on Bandages, we find the properties of a roller thus enumerated: "Efficit enim ut quæ abſceſſerunt propellantur, hiantia conjungantur, perverſia dirigantur atque omnium contraria preſtentur."

† The Dolloires are marked in the plate in next page, 1, 2, 3.

‡ Renverſées of the roller are marked in the ſame plate, a, b, c.

ſupport the diſeaſed part with a particular preſſure; you muſt lay compreſſes upon the hollows, and upon the bed of each particular abſceſs, and change the place of theſe compreſſes from time to time, ſo as now to prevent matter ſinking into a particular hollow, now to preſs it out from a place where it is already lodged, and again to reunite the ſurface of an abſceſs already completely formed, from which the matter has been already diſcharged.

4thly, In the case of a fistula, or where the abſceſs has hardened into a callous tube, while you pare away the callous edges, or cauterize them; while you open particular mouths of the fiſtula with the knife, or dilate them with ſponges (which you ſhould prefer if you are afraid of an hoſpital ſore); while you ſtimulate the internal ſurfaces with gentle ſolutions of corroſive ſublimate, ſpirits, or ſtimulant balſams, as ſolutions of gum, aloes, &c. in ſpirits; you muſt lay ſuch a train of compreſſes along the courſe of the fiſtula as will bring the ſides into contact; and when you uſe a ſeton, whether it be in fiſtula, to excite the tube, or in irregular abſceſs, to lead the matter, and concentrate the diſeaſe, you learn by means of the ſeton the direction of every irregular paſſage, and hollow tract in

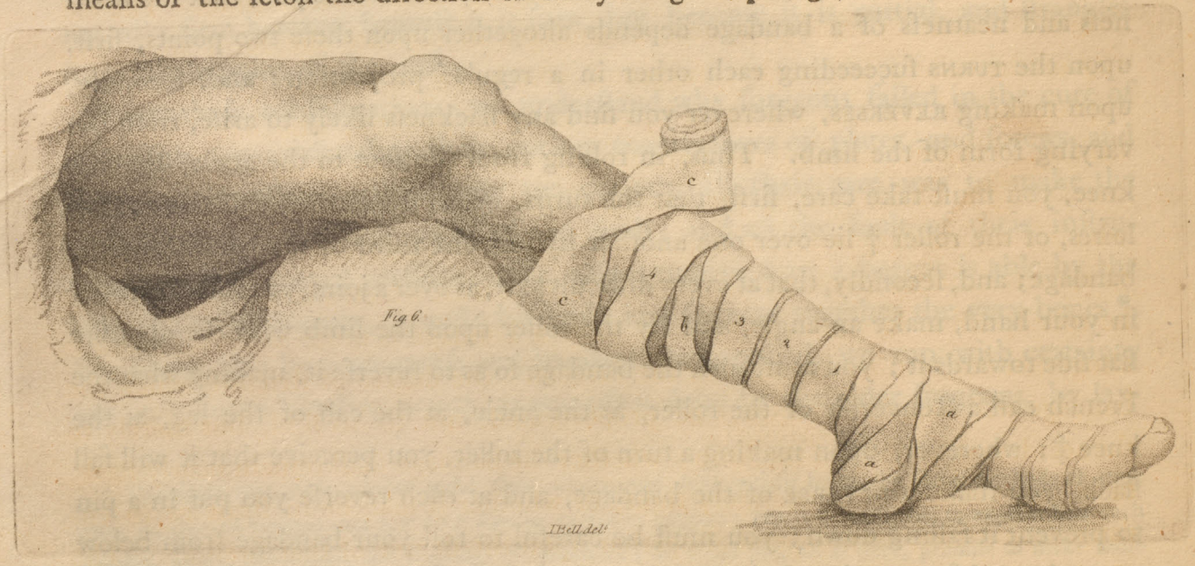



Fig 6.

the limb, and know, of courſe, where to lay your train of compreſſes, and what form to give them.

In a limb full of diſeaſe, undermined with ſuppurations; in that complication of diſorders which I have already deſcribed of ſwelled joints, fiſtulous or irregular abſceſſes, or diſeaſed burſæ pouring out their peculiar matter in profuſion, the roller ſerves every purpoſe at once; and in addition to theſe uſes which I have juſt deſcribed, it gradually overcomes the general ſwelling of the limb: for this ſwelling is either a leucophlegmatic ſwelling, which this kind of ſupport diſſipates quickly, or it is a low inflammation in which this general ſupport is ſtill more needed: ſuch inflammation proceeds merely from a gorging of the veſſels; and ſtimulating fomentations, camphorated oils, and a well rolled bandage, are the ſureſt cure. This laſt uſe of the bandage, viz. of diſſipating ſwelling, and ſuppreſſing this low inflammation, I ſhall be able to ſet before you, in a ſtrong point of view, by ſtating one obſervation which I have often had occaſion to make. Surgeons have hitherto complied with a very abſurd practice belonging to the old ſurgery, viz. the rolling and bandaging of a broken limb. The old ſurgeons meant by their complicated bandages to regulate the form and quantity of the callus; but modern ſurgeons, who know better things, who have no expectation of affecting the callus by any outward preſſure, who have indeed no deſign but that of keeping the limb ſtraight and quiet, no motive for rolling or bandaging a broken limb, yet continue this practice! The terrible accidents which ſometimes happen from imprudent bandaging, had indeed been the occaſion of endleſs diſputes about the degree of firmneſs with which a broken limb ſhould be rolled, while in truth the effect of ſuch a bandage is quite uncertain, and is altogether out of the command of the ſurgeon! the degree of ſtricture which the bandage will make muſt always be proportioned, not to his ſkill, but merely to the accidental ſwelling of the limb; whether the bandage ſhall remain nearly ſlack, or whether it ſhall be moderately tight, or whether it ſhall be ſo ſtrait as to endanger gangrene, muſt depend altogether upon the degree of that ſwelling. The country ſurgeon rolls up a fractured limb, and it is long before he viſits his patient a ſecond time; the patient thinks it a duty to bear every uneaſineſs of his ſituation, knowing that his leg was bound up by a ſkilful ſurgeon; if unhappily the limb ſwells, and matters be left in this ſtate for two days, it falls into gangrene: but if the ſurgeon fortunately ſees it in twenty-four or thirty-ſix hours, he is juſt in time to ſave it; he finds the bandage very tight, the foot ſwelled to an enorm-

ous degree, the inflammation dark coloured and livid, the leg ſpotted with gangrene, and ſtudded with ſmall veſicles, and each turn of the roller has left its mark in the limb.—What ſhould be done with ſuch a limb? Stop a moment and think what ſhould be done? Should the bandage be cut off, and the limb laid at its eaſe upon a pillow? Should it be wrapped in a relaxing poultice? It is inflamed! ſhould it therefore be treated with leeches, and continual fomentations? Surely not, we muſt do the very reverſe of what is uſually done in ſuch caſes. The practice which ſhould be adopted explains pointedly the very thing to which I would now direct your attention. Such low inflammation, whether produced ſuddenly by a tight bandage, or ſlowly by the general diſeaſe of the limb, is beſt cured, not by taking away the bandage, but by applying a firm and well rolled one. This accident happens too often for me to be deceived in what ſhould be done. When I find a limb in this condition, ſwelled by an ill applied roller, if it be already gangrened, I let it alone, but if it be recoverable, I cut off the roller, compreſs, and work, and ſmooth the parts with the hands, roll the limb very carefully, nicely, and firmly from the very toes, and moiſten the bandage with ſpirits of wine: we muſt proceed expreſsly in the ſame careful manner with a diſeaſed limb, for the ſwelling is of the ſame nature. Cutting off the bandage from ſuch a limb as this, and laying it at eaſe, will but ſolicit more ſwelling towards that part, juſt as laying a diſeaſed limb in poultice will perpetuate the diſeaſe: by applying a roller judiciouſly, we prevent the ſwelling of a member, or recover one that is already ſwelled.

It is in the complicated caſe of a ſwelled and diſeaſed limb that we are ſenſible of all the uſes of a bandage, which is a univerſal cure for all its diſorders. By the bandage we diſſipate the leucophlegmatic ſwelling, abate the inflammation, prevent the extenſion of matter, leſſen ſuppurating cavities, cloſe the walls of fiſtulas, procure the reunion of ſurfaces which have ſuppurated. The patient is ſenſible of an eaſy and pleaſant firmneſs from the bandage, and the limb is actually ſupported againſt accidents, and the further extenſion of the diſeaſe. This effect of bandage is obſervable, not merely in this ſingle caſe of an ill bandaged limb, but is equally obvious and intereſting in other caſes; for in varices, though a permanent bandage is uſually required, yet ſometimes the parts are ſo ſtrengthened by a roller that they recover their tone. It is alſo by curing this low inflammation, reſtoring the tone of the parts, and ſtrengthening their action, that bandage cures ulcer in the leg. If you have ſeldom ſeen ulcer even rendered

ſtationary by a bandage, much leſs cured by it, remember how very ignorantly you have ſeen ſuch rollers applied. You have ſeen them drawn round the ulcer, round the ſhin alone, with the firmneſs of a tourniquet; the middle of the leg bound very tight, the foot ſwelled, the ulcer inflamed, the marks of the roller left in large ridges; you have ſeen it recovering in the morning, only to be tortured into the ſame condition before night! the limb truly little ſhort of that condition which I have juſt deſcribed in the caſe of a broken limb imprudently bandaged, livid, ſwelled, and verging towards gangrene. Inſtead of this it ſhould be rolled from the very extremities of the toes, and then roll it as tight as you will you can do no harm. It ſhould be rolled in the morning upon riſing from bed, in ſuch a manner as to fit it to bear the fatigues of the day; to ſupport and defend the ulcer, and keep the ſwelling all above the ſore; this conſtitutes the true value of the ſticking plaſters, which have been ſo ſucceſsfully uſed by Dr. Bainton: Firſt, The ſore is thoroughly cleanſed, its edges ſmoothed and wrought forwards, and firmly compreſſed by the drawing of the plaſter: Secondly, The limb is rolled from the toes to the ſore, then over the ſore, and ſome way upwards, ſo as to ſecure the relaxed parts; the bandage ſo rolled, by a ſkilful hand, is the only certain cure; neither ointments, nor mercurial preparations, nor ſponges, nor leaden plates, will cure an ulcer, it is to be cured only by firm, equable, and perfect compreſſion, which muſt be renewed more than once a day if the bandage becomes looſe. There is no inflammation of the lower extremities in which I do not experience the good effects of firm rolling. Even mere feeling and vulgar experience inſtruct a man when he has an ancle ſprained to bind it firm; and in a diſeaſed burſa (as in a relaxation of the knee joint), that diſeaſe, which with but a little indulgence, a very little encouragement of fomentations, poultices, bleedings, and low diet, would end in white ſwelling of the knee; may be ſtopped even by ſo ſimple a matter as a well rolled bandage. Stimulants, as calomel, opium, and good diet, will keep the ſyſtem well; and the joint itſelf may be excited to a healthy action, by pouring hot mineral waters on it, by animal oils, camphor, laudanum, frictions, and moſt of all by ſupporting the action thus excited by a general roller, well and carefully applied, and by particular compreſſes applied upon each burſa. By a compreſs, merely on each ſide of the knee joint, when the great Capſule of the joint itſelf was ſwelled, I have reduced the ſize of a dropſical knee by the quantity of three or four ounces in a night's time; the fluid being fairly and une-

quivocally abſorbed, without any deception ariſing from its being puſhed into the ſurrounding cellular ſubſtance. I have frequently in a few days reduced prodigious dropſical ſwellings of the knee, relieved the patient from great pain, reſtored the uſe of the limb, and made an abſolute and permanent cure. The common ſprain of the ancle alſo is a ſlighter diſeaſe, a temporary one of thoſe burſæ which accompany the Peronæi tendons. It ſeems to be accompanied with very quick and active inflammation; if it be but a little indulged by long fomentation in tepid water, leeches, poultice, and ſuch things as relax the parts, it is rendered a very tedious diſeaſe, and the joint becomes ſwelled and gummy, lame for months, and rheumatic for years, and liable to be eaſily hurt again by the ſlighteſt ſtrain upon it; but if this ſwelling be oppoſed vigorouſly by hot fomentation, continued but for a ſhort time, camphorated ſpirits, a very firm bandage, and long compreſſes firmly preſſed down behind the ancle, and if after a few days cold water be poured upon the joint, if it be rubbed, and ſtill firmly bandaged after it ſeems well, it will be eaſily cured, and no remaining weakneſs left to remind us of the accident. Be aſſured, that much of the ſucceſs, and all the ſkill of quacks in ſprains, conſiſt in applying bandages. When they do harm, it is by uſing bandages when they ſhould not be uſed. When they do good, it is by a fortunate uſe of this ſimple proceſs which I am now recommending to you.

By compreſſion merely, ganglious may be obliterated, tumors of various kinds diſſipated, and proud fleſh or fungus ſuppreſſed: indeed much may be done by compreſſion, which it is no part of my deſign to mention in this place. I am ſatisfied with remarking ſome common and uſeful facts, which are not to be regarded as trivial, when they ſerve to eſtabliſh a general concluſion in your minds; and theſe general remarks will, I truſt, be found important, as furniſhing rules of conduct in the daily duties of your profeſſion, and be the more acceptable, as they are not impoſed on you with the forbidding formality of aphoriſms.

It is not ſurpriſing that the forms of bandages are ill explained; I never could perceive that even the general intention and properties of a bandage were ſufficiently underſtood. Bandaging a wounded or diſeaſed part is not a mere ceremony, nor is it uſed only for parade and for the credit of the ſurgeon, elſe we ſhould ſtick to the antique bandages of Galen and Soranus; we ſhould prefer the ſcapha, or boat-like bandage, the gallia gladiatoris, or bandage like a gladiator's helmet, the regium, or bandage in form of a crown! to any that we now ſee. Thoſe innumer-

able forms in which the ancients turned the roller round the head, neck, and body (plainly intended more for parade than uſe), are to be found in the treatiſes of Soranus, Glaucus, Diocles, and Galen. In their treatiſes I find nothing but what has fallen into deſerved neglect, nothing that I could mention either for your amuſement or inſtruction. But ſince thoſe days, the ſubject has become even more perplexed, no one author has underſtood another; we have in one book deſcriptions without drawings; in another, drawings without names; in a third, deſcriptions, drawings, and names, ſo confuſed, that we are apt to loſe all the conceptions we have ever formed on the ſubject. He would be a very active, and, at the ſame time, a very idle man, who ſhould ſet himſelf to diſentangle all this confuſion for you, and prove by expreſs authority and quotation where the intentions of Soranus, Heliodorus, or Galen, were exactly fulfilled by the deſcriptions and drawings of modern authors. This is the only occaſion in which I would interdict you the ſtudy of hiſtory! Why ſhould we go back to the ancients in this pitiful manner to learn from Galen or Soranus to tie up a limb? If common ſenſe and ordinary ingenuity, and the knowledge we now have of the higher parts of our profeſſion, cannot ſupport us in ſo plain a matter as this, we muſt think very poorly of ourſelves; but as Paree obſerves, I ſee nothing to perſuade me "that nature has laviſhed all upon the ancients, or that ſhe has quite played the ſtepmother with us." I hope to make the ſtudy of this department in the hiſtory of your profeſſion quite unneceſſary for you, by explaining to you a neat ſhort ſyſtem of bandages, and as I go along I ſhall endeavour to point out ſuch things in the hiſtory of each bandage as it is right that you ſhould be acquainted with.

I have reduced all bandages to thoſe few which are repreſented at the head of this chapter. It is very true, that if you put a roller merely into the hands of a ſkilful ſurgeon, he will turn it ſo curiouſly round any part of the body, as to enſure every poſſible purpoſe; but this he will accompliſh beſt who is moſt familiar with every other kind of bandage; and there are really certain bandages peculiarly, and, as it were, naturally appropriated to certain parts of the body. The characters and properties of thoſe which I am to deſcribe are as follows.

The Linteum Scissum, or Split Cloth, marked No. 1. is peculiarly adapted to the head: it covers the whole ſcalp, and its legs or ſplit parts tie firmly round the

occiput and forehead ; it may be made with ſix or with eight tails, according to the parts you wiſh to compreſs *.

The SINGLE SPLIT CLOTH, or bandage with four tails, No. 2. which is called the CAPISTRUM or Stirrup, or the FUNDA or Sling, is the proper and peculiar bandage for the face : in cuts of the forehead, or of the face, of the noſe, of the lips, in fractures of the jaws, and in every wound which is beyond the circle of the hairy ſcalp, we uſe the Sling, or Double-tailed bandage.

The T BANDAGE, No. 3. which is named from its reſembling the letter T, is the peculiar bandage of the body. If the breaſt or belly be wounded, we make the circular (a) very broad, which ſerves as the proper bandage of the body, and we ſplit the tail-part (b), and paſſing one leg over each ſide of the neck, we pin it to the circular, ſo that it forms a ſuſpenſary for the main bandage, which prevent its ſlipping down. But if we have a wound, or diſeaſe, or operation near the groin or private parts, the tail-part becomes then the moſt important part of the bandage ; then the circular is ſmaller, and goes round the pelvis, while the tail-part is made very broad. When the diſeaſe is in the private parts, perineum or anus, we often ſplit the tail according to circumſtances ; but when the diſeaſe is in one groin, we generally leave the tail-part of the bandage entire and broad.

The ROLLER, No. 4. is the peculiar bandage of the limbs, for accompliſhing all thoſe objects which I have juſt explained to you ; it ſerves for the limbs, ſhoulders, haunches, and occaſionally for the body ; it is often ſingularly uſeful in bandaging the head, where peculiar firmneſs is required, and there always you are to uſe the double headed roller. You take one head of the roller in each hand, and by that which is in your left hand, you fix down the turns of that which is in the right, ſo that you can make your bandage ſmoothly firm over the whole head, can knot it at particular points, can turn it in every direction, and fit it to every occaſion. Wherever the roller is to be uſed as a uniting bandage (i. e.) to be applied round any part, ſo that the legs meet and croſs each other over a wound (to draw its lips cloſe together), we make a ſlit in the roller, ſee No. 5. and paſs one of the rolls through it, and thus we make the decuſſation of the bandage very ſure, and give it peculiar effect upon the wound. Theſe are the four bandages which I proceed to deſcribe, and I believe I ſhall ſatisfy you that you may throw aſide every other.

* Marginal plate at the beginning of this chapter.

## OF BANDAGES FOR THE HEAD.

The head, from its ſhape, admits with difficulty the application of a bandage; it is more frequently wounded than any other part, and it is wounded very irregularly: When the ſcalp is generally bruiſed, or cut in many places, it requires the Linteum Sciſſum, or Split Cloth, which may conſiſt of ſix or of eight legs; and theſe are put round the head in various ways.

1ſt, When the cloth has ſix heads, it is applied as in fig. 7. 8. 9. The middle or unſplit part of the cloth (vid. c fig. 1. 7. 8. and 9.) is applied to the middle of the head. The two tails (d d) go round the temples, and are pinned at the occiput; the two other tails (e e) go alſo round the temples, and are pinned over the forehead; the two middle tails (f f) are uſually directed to be tied under the chin, but this ſuffocates and heats the patient; and unleſs it is neceſſary for the ſecurity of the general bandage, I prefer tying them over the top of the head, or obliquely, in order to preſs firmly upon any particular point.

The older ſurgeons uſually ſplit this middle tail into two parts, one broader, and the other narrow; in the broad one they made a hole to let the ear paſs

through, and tied that broader one under the chin, and the narrower they tied over the head obliquely. Though this gave the ſplit cloth the effect of eight tails, yet they did not name it the ſplit cloth with eight tails. When they ſplit the cloth into eight tails, and eſpecially when they tied the eight tails in the following particular manner, they called the bandage CANCER, as reſembling a crab in the number of its legs. The CANCER, or ſplit cloth of eight tails, was laid ſo over the head (vid. fig. 10. and 11.), that four tails hung over the forehead and eyes, and the other four hung over the back of the head; they were tied in the following order: firſt, the two outermoſt tails, before marked (a b), were tied over the forehead, and the tails (c d) left hanging over the knot; then the two outermoſt tails behind, viz. e and f*, were tied round the occiput; then the middle tails were tied! firſt c d, the two middle tails before were croſſed over each other, carried round the temples, and pinned at the occiput; then g h: The two middle tails behind were croſſed over each other, carried round the temples, and pinned over the ears, or near the forehead †.

## OF THE FOUR TAILED BANDAGE, OR SINGLE SPLIT CLOTH.

* N. B. f cannot be ſeen in fig. 10. becauſe it is on the farther ſide of the head; but in fig. 11. e f are ſeen hanging down behind the knot which they form, being tied under the occiput.

† Medium amplecti debet univerſum caput, ſic ut quatuor partes a fronte recte dependant ab occipitio totidem ex illis exteriores ad occipitium porrectæ inter ſe alligentur: ex his exteriores ſimiliter fronti circun-

The Four Tailed Bandage, or Single Split Cloth, is the peculiar bandage for the forehead, face, and jaws; if the forehead be the part wounded, this ſimple and very convenient bandage is applied, as in fig. 12. The bandage is made by taking a ſtrip of cloth not quite ſo broad as the palm of the hand; it is to be torn or ſplit up at each end, ſo as to leave only a convenient length of the bandage entire to be applied to the wound; the middle or unſplit part (a) is applied to the forehead, one tail (b) is carried round the back head to meet its fellow. The other tail (c) is carried, as ſeems beſt, either upwards over the crown of the head, or downwards ſo as to tie under the chin.

If the top of the head or ſinciput be the part wounded, the bandage may be applied, as in fig. 13. laying the unſlit part (a) upon the wound, making one tail (b) paſs down under the chin, while the other (c) is long enough to go round the head like a fillet, ſo as to ſecure the bandage from ſlipping backwards and forwards. It may go round to the occiput only, or it may go round the occiput and return to the forehead, and tie there.

In cuts of the lip or noſe, or both, after putting proper ſtitches in the noſtril, lip, &c. we apply the funda or ſling, as in fig. 14.; we make one ſmall opening to receive the tip of the noſe, and we do not forget to make two ſmall holes oppoſite the two noſtrils for breathing. If the noſtril or the tip of the noſe be much wounded, or almoſt cut off, after putting in one or two ſtitches with the needle, we wrap lint neatly round the quills to put into the noſtrils. The quills ſerve for breathing through, and the lint dilates and pads up the noſtrils, ſo as to keep the noſe in its proper ſhape, and by diſtending the noſtril it keeps the parts in very nice and equal contact; one tail of this bandage ties at the nape of the neck, the other croſſes its fellow at the back of the head, and then turns round to meet it, and to tie on the forehead; and ſometimes the lower part alſo is brought round to tie at the forehead. If the upper lip be cut, and a bandage needed (which ſeldom is the caſe), it is almoſt ſuperfluous to ſay that this bandage will ſerve the purpoſe. It ſerves alſo in cuts of the lower lip, though there alſo we truſt rather to hare-lip pins than the bandage; but this bandage is particularly uſeful in ſupporting the lower jaw where it is broken. This bandage, when applied thus to ſupport the lower jaw, is named Capiſtrum or Bridle (as it goes round the jaws ſomewhat like a horſe's halter). In ſome

datæ a latere diligentur, tum ex reliquis quæ in fronte ſciſſæ partes ſunt ad occipitium quæ in occipitio ad frontem attrahantur. GALENUS DE FASCIIS.

caſes the circumſtances require us to ſupport the chin particularly, and then the unſlit part of the bandage is applied upon the chin, with a ſmall hole to receive the point; but where the jaw is broken, we pad up the jaw-bone into its right ſhape, with compreſſes preſſed in under the jaw, and ſecured by this bandage; where we are in fear of hæmorrhagy after any wound or operation near the angle of the jaw, we can give the ſling a very remarkable degree of firmneſs. For this purpoſe, we tear the band into three tails on each ſide, we ſtitch the bandage at the bottom of each ſplit, leſt it ſhould give way when drawn firm; and having laid our ſponges firſt into the bleeding parts, and then laid compreſſes above them, we make the tails of the bandage depart from each other juſt over the point where the danger is, as in fig. 15. where two tails (a) turn round under the occiput, and are tied there; two others (b) croſs each other a little higher, come round by the temples, and tie upon the forehead; and the two other tails (c c) may either tie upon the top of the head, or return and tie under the chin. In thoſe caſes, ſtrong and firm preſſure being required, it is not amiſs to have two legs of the bandage long enough to be juſt twiſted at the top of the head, and to return and tie under the angle of the jaw with a firm knot. But for purpoſes like theſe, viz. of ſuppreſſing hæmorrhagy after operations, or ſupporting a broken jaw, or plugging up a gunſhot wound where there is great hæmorrhagy, ſuch as we cannot command with the needle, there is a certain form of the double-headed roller, which I ſhall preſently recommend in preference to this; it is named the Knotted Bandage.

## OF THE COUVRE-CHEFF, OR KERCHIEF.

IBell del

Theſe are the peculiar bandages for the head and face. The much celebrated Couvre-Cheff, or Kerchief, I can hardly conſider as a bandage; it is no better than a night-cap; it can ſerve no purpoſe of compreſſion, whether to unite wounds, or ſuppreſs hæmorrhagies, or prevent the ſpreading of ſuppurations under the ſcalp; it ſerves no other purpoſe than to keep on the looſeſt dreſſings. When you have performed the operation of trepan, and have merely to lay a piece of lint upon the wound, you may uſe the couvre-cheff, or handkerchief, which is applied in two ways; either in a triangular form, the thick part applied to the forehead, the angle thrown over the head, and the points paſſing each other on the occiput, and brought forwards and pinned over the forehead, in a manner which is too common to need any drawing.

The other manner of applying the handkerchief, called the Grand Couvre-Cheff, or Great Kerchief, is as follows:

You take a large handkerchief, and fold it, not in a triangular, but in a ſquare form; you let one edge project about three fingers breadth beyond the other, in order to form a general border for the bandage; you lay the handkerchief upon the head, ſo as to make the lower fold, to which the projecting border belongs, lie next the head; and the projecting border hangs flapping over the eyes till the bandage is all adjuſted. Theſe two figures, fig. 16. and 17. ſhow the ſucceſſive ſteps by which the bandage is adjuſted. Fig. 16. ſhows the kerchief laid looſely on the head; (a a) are the two corners of the outermoſt fold hanging down; the firſt ſtep is to tie them under the chin; (b b) marks the projecting border, which is to be turned back, and pinned in a circular form round the face, at the time that the corners of the fold next the head, marked (c c), are carried backwards.

The third motion is, to carry the two corners (c c) of the fold next the head backwards, where they croſs each other at the occiput, and either are tied there, or are brought round again, ſo as to be pinned down over the ears, or thereabout, but ſhorter or longer, according to the length of the handkerchief. The fourth point in adjuſting this bandage, and which finiſhes it, is explained in fig. 17. where it is ſeen, that after the outer corner (a a) has been tied under the chin, after the inner corner (c c) has been drawn out and carried round the occiput, and after the border (b b) has alſo been turned back and pinned, the doubling of the handkerchief at (d) is left looſe, and very clumſy, hanging over the neck; therefore it remains to gather up this clumſy part of the napkin, to

fold it neatly, and to pin it up above the ear. I am ſorry to ſpend ſo much time in deſcribing a bandage which I cannot much commend; it makes no particular preſſure; and, by its weight and cloſeneſs, heats and ſuffocates the patient. Indeed, I know hardly any good property it has but one; as Heiſter ſays, "It keeps out the cold; for which reaſon it has come into very general uſe with us," i. e. in Germany and Holland.

## OF APPLYING THE ROLLER TO THE HEAD AND JAWS.

But the Roller is the univerſal bandage; it ſupplies occaſionally the place of all thoſe which are peculiar to the head or face; is applied to the head in the following manner; 1ſt, As a uniting bandage. When the cut is, for example, on the forehead, the two heads of the roller are croſſed over the cut, by paſſing the head at one end, through a nooſe in the other end; and I find it of infinite advantage to touch either the roller itſelf, or the ſkin near the cut, with ſome adheſive plaſter, which gives the roller a firm hold upon the ſkin, fig. 18. where the roller is ſuppoſed to croſs over a wound.

2dly, In great lacerations, or in extenſive ſuppurations of the ſcalp, the general preſſure which ſuch a caſe requires, may be made by turning the double-headed roller with both hands round the head; and while the right hand ſurrounds the head with circular turns, the left hand croſſes the top of the head at each turn of the roller, and, when finiſhed, it makes the bandage which is drawn, fig. 19.

It is called the CAPELLINE BANDAGE, and is the ſame with that which was a few years ago uſed for binding up a ſtump after amputation.

3dly, When the jaw is broken, the double-headed roller keeps the parts very firm, and this bandage winds in every direction which the exigencies of the caſe may require; for whenever you wiſh to turn the bandage to make it peculiarly firm, you have but to croſs the rollers, and change hands. But there is nothing ſo peculiar in this form of bandage, nor ſo far differing from the capiſtrum, or ſplit cloth, as to need a drawing.

4thly, In every caſe of dangerous bleeding from about the jaws, the parotid gland, the ear, &c. I prefer that form of the double-headed roller which is ſeen in fig. 20. when at each turn you twiſt and knot the bandages over the point where the danger is; whence this form of the roller is called particularly the KNOTTED OR TWISTED BANDAGE.

## BANDAGES FOR THE NECK AND BODY.

Having already deſcribed the proper bandage of the limbs, which is indeed but a ſingle roller, I ſhall proceed to explain to you how that roller is to be turned round the body. The chief difficulties are in approaching the body, I mean, in making the roller turn from the head over the ſhoulder and back, or from the thigh over the groin; and this muſt be taught rather by drawings than deſcription. To be plain with you, bandage cannot be of much uſe in wounds or diſeaſes of the neck: there we muſt, in caſe of wounds, expect reunion from the cloſeneſs of our ſtitches; and in fiſtulas of the neck, we expect a cure rather from ſetons, and other modes of dreſſing, than from the compreſſion of a bandage. But the bandage which is generally uſed I have repreſented in fig. 21. it is made with a double-headed roller, begins with one turn round the forehead, and then deſcends by croſſings over the neck, then turns round the body, then up again upon the neck; and by thus turning it round the neck, or over it, and croſſing in various forms over both neck and ſhoulders, we can make it tolerably firm. This bandage is uſeful eſpecially when, after purſuits with horſe, many of the infantry are brought in, who have been cut down with wounds of the ſabre about the back of the head, the neck, or the ſhoulders.

2dly, The next and greateſt difficulty is in approaching the trunk from the arm, and turning the bandage over the ſhoulder. The beſt form of bandage is the very old one, repreſented in fig. 22. named Spica, becauſe, when made, it reſembles ſomewhat an ear of corn. We begin the bandage at (a), by laying the middle of a double-headed roller under the axilla; we carry the two heads firſt round the body, then obliquely up over the breaſt and back, and make them croſs each other over the ſhoulder, (b); both heads are then carried round the affected arm at (c c), then up again over the ſame ſhoulder, and croſs upon the top of the ſhoulder, and then down again over the breaſt and back, ſo as to make a ſecond turn (d) under the ſound axilla, and then the roller is returned over the breaſt and back a ſecond time to the affected ſhoulder. This ſpica bandage is ſufficiently explained by the drawing; it is often made over both ſhoulders, and is then called the Double Spica, being made with equal croſſings on the breaſt and back, and equal croſſings upon each ſhoulder, both over and under it. This bandage is alſo uſed in approaching the trunk of the body from the thigh: the bandage is then called Spica Inguinalis, the Spica of the Groin, and begins with a turn round the pelvis.

This ſpica, in various forms, ſometimes turning more particularly round the

pelvis, and ſometimes turning chiefly round the limb, according as the trunk or the limb is moſt wounded, makes a very firm bandage. In fractures of the clavicle, in wounds about the upper part of the breaſt, in hæmorrhagies from the mammary arteries at the top of the breaſt, in fractures near the head of the ſhoulder-bone, in amputations very cloſe to the trunk of the body, we find this bandage, the Spica Humeri, very uſeful. The ſpica inguinis is equally uſeful in hernias of the groin, in luxations of the thigh bone, in wounds of the upper part of the thigh, or lower part of the belly, in ſupporting aneuriſms of the femoral artery, and in a thouſand indeſcribable caſes.

3dly, When the thorax is wounded or diſeaſed; when the ribs are much broken; when the ſternum is carious, with ſuppuration; when a ſchirrous breaſt has been extirpated; when we perform the operation for empyema, (that is, when we make an opening to let out matter confined within the cheſt); we may uſe either of theſe two bandages, the Stellated Bandage, fig. 24. or the Napkin and Scapulary, fig. 23. The ſtellated bandage (ſo named from the turns of the roller croſſing each other in a ſtar-like form), is the more uſeful where a particular and powerful preſſure is required: it may be fixed, and prevented from ſhifting, by putting in pins from point to point, and it ſignifies little where it begins or where it ends. This drawing, No. 24. will enable you to practice this kind of roller; and you will learn alſo from it how to fix the broad roller round the cheſt; for if at any time you ſhould prefer this ſimple broad roller to the napkin and ſcapullary, you have but to turn the roller round the cheſt, ſo as to perform its office of a bandage for the cheſt, and then to give it one or two turns round the ſhoulder, ſuch as are repreſented in the drawing, No. 24. ſo as to give it firmneſs and ſecurity. But, indeed, the more common bandage, fig. 23. the Napkin and Scapulary, is much eaſier and pleaſanter; ſo that, except upon particular occaſions, I adviſe you to uſe it. It is called Napkin and Scapulary, becauſe in general it is made by taking a table napkin, folded lengthways four or five times; which being put ſmoothly round the body, and pinned firmly, is ſuſpended by the ſcapulary, ſo named from its lying flat over the ſhoulders. The ſcapulary part of the bandage is juſt a ſlip of linen ſplit half its length, ſo that its two legs being laid round the neck, the unſplit part before is pinned to the circular or napkin; and the two legs being made to croſs each other behind, are alſo pinned to the circular, one on one ſide, the other on the other ſide.

The T bandage, belonging to the groin or private parts, is ſo continually uſed, while almoſt all other bandages are neglected, that it would be as ſuperfluous to explain it, as it is uſeful to explain the others. I have given no drawing of the T bandage; but in reſpect of all the others, I have acquitted myſelf in my duty towards you, ſo as to be ſatisfied in ſome degree with what I have done. I find, indeed, that I have not entered ſo much into the hiſtory of the old forms of bandage as I once imagined I ſhould need to do, in order to make my own ſyſtem intelligible. I have firſt explained fully the uſes of each kind of bandage; I have ſelected for you, from the obſcurity of the ancient, and the inconſiſtency and confuſion of modern authors, a ſhort intelligible ſyſtem in which you will find no diſcrepancies and perplexities of names, deſcriptions, and drawings; for, when I had ſettled upon the ſyſtem which I was to recommend to you, I put each bandage upon the living body, ſet the ſubject before me, and as I deſcribed I drew.

I will not tell you, what has been but too often repeated, that the NIGHT-CAP, WAISTCOAT, and STOCKING, will at times ſuperſede every other bandage. I muſt rather remind you, that, as a general doctrine, this is quite oppoſite to the principles which I have laid down. It is a way of ſpeaking that favours too much of that ſlovenly practice in which poultices, fomentations, filth, and rottenneſs, and diſeaſes, go hand in hand. The night-cap, waiſtcoat, and ſtocking, ſuperſede no bandage; they are only uſeful where bandages are not required.

# DISCOURSE V.

## ON HÆMORRHAGY.

A HISTORICAL AND PRACTICAL DISCOURSE ON THE EFFECTS OF HÆMORRHAGY—THE VARIOUS MEANS OF SUPPRESSING HÆMORRHAGY—AND THE DOCTRINES OF MODERN AUTHORS CONCERNING THE RETRACTION OF ARTERIES.

TO expire by ſucceſſive hæmorrhages is perhaps the leaſt painful of deaths, and yet it is the moſt awful. The repeated loſs of blood ſo directly intimates approaching diſſolution, and the patient feels his ſpirit and ſtrength ebbing ſo perceptibly at each return of hæmorrhagy, that he clings to life. Thoſe of the moſt reſolute mind are overcome with anxiety which they cannot conceal, and look round for ſome one to delay at leaſt the fatal moment: and the ſurgeon

feels himſelf ſo reſponſible, that with him it is truly an anxious ſcene. If the bleeding be ſlow and gradual, from ſome extenſive ſurface, as from a polypus of the noſtrils, from the womb, from the ſurface of a ſtump, or from ſome extenſive ſore, the ſurgeon is ſent for from hour to hour; he is called during the night; he is made unhappy for weeks; and, after repeated uncontroulable hæmorhagies, he ſees his patient expire. But, if there be a ſudden hæmorhagy from the veſſels cut in any operation, or from an aneuriſm, or from ſome great wound, the arteries of which cannot be diſcovered, there is immediate danger of the patient expiring even in the ſurgeon's hands.—Let thoſe who have witneſſed the agitation of ſuch ſcenes judge of the importance of that ſubject which I am now to explain to you; indeed I may appeal directly to yourſelves! Is not this fear of hæmorrhagy always uppermoſt in the mind of the young ſurgeon? Were this one danger removed, he would go forward in his profeſſion almoſt without fear.

It is the daſhing of the blood from the great arteries, and the fainting of the patient, that hurries our moſt important operations, and makes all the difference betwixt operating on the living body, and diſſecting the dead. It is this which unſteadies at times the hands of the boldeſt ſurgeon, and makes his heart, at the firſt alarm, ſink within him. No ſurgeon nor ſpectator can keep the natural colour of his cheek when a patient is expiring, or in danger of expiring, by loſs of blood; and the actual death of a patient muſt leave a laſting melancholy on the ſurgeon's mind.

It is really this accident of hæmorrhagy that has retarded the improvement of our profeſſion for ages! for the ancients, ignorant of the ways of ſtopping hæmorrhagies, did not venture to cut out the moſt trivial tumor, or they did ſo with fear and uncertainty. They performed thoſe operations ſlowly and imperfectly with burning irons or ligatures which we now perform rapidly and ſafely with the knife. If they ventured to amputate a member, it was only by cutting after it was gangrened, among the putrid fleſh. They merely ſeparated parts which were already dead and bloodleſs; ſo great was their abhorrence of blood.

In ſlow and in ſudden hæmorrhages the ſymptoms are very different. In thoſe ſlow hæmorrhages which ariſe from polypi, from ſmaller aneuriſms, from ulcers where the veins and arteries are deeply eroded; in hæmorrhages from the ſurfaces of the noſtrils, ſtomach, lungs, or womb; from varices of the lower extremities, or from the hæmorrhoidal veins, the patient is very ſlowly exhauſted. At each re-

turn of bleeding the patient faints, and is laid in bed, and the cold applications and the fainting ſave his life. He riſes, after ſome days, pale, languid, and giddy. The pulſe flutters, and is hardly to be felt; the breathing is quick and anxious, accompanied with ſighing and great oppreſſion; the heart palpitates on the ſlighteſt motion; and the ſlighteſt inclination of the head, or riſing ſuddenly from the couch, endangers fainting. The voice is low; the eye is languid, colourleſs, and of a pearly white, like that of a conſumptive perſon; the fleſh feels ſoft and woolly, and the ſkin is pale, yellow, gelatinous, and, as it were, tranſparent like modelled wax. The complexion of the lip or cheek never returns, even if the perſon ſhould recover. After this ſtage of weakneſs the blood loſes its colour; from this time forward it is a bloody ſerum only that diſtils from the veſſels; dropſy appears; and the ſlighteſt loſs of blood proves fatal.

But when the patient expires ſuddenly by an impetuous bleeding from ſome great artery; when he dies of the bleeding from a femoral aneuriſm, or amputated limb; when he is wounded among the viſcera, and ſome great veſſel is pouring out blood, the ſymptoms are the ſame as in that ſudden uterine hæmorrhagy which happens in the latter months of pregnancy, in conſequence of the placenta being implanted over the orifice of the womb. The blood in the general circulation, in place of being forced onwards by the contractions of the arteries, runs backwards towards the wound from all parts of the body. The arteries no longer puſh on the contents of the veins; the blood ceaſes to flow towards the heart; the heart ceaſes to act; and the countenance aſſumes, as in aſphyxia, a livid hue from want of circulation. The face becomes all at once deadly pale, the circle round the eyes is livid, the lips are black, and the extremities are cold. The patient faints, revives, and faints again; with a low and quivering pulſe, he is ſick, and his voice is loſt. There is an anxious and inceſſant toſſing of the arms, with reſtleſſneſs, which is the moſt fatal ſign of all. He toſſes continually from ſide to ſide; his head falls down in the bed; he raiſes his head at times ſuddenly, gaſping as it were for breath, with inexpreſſible anxiety; the toſſing of the limbs continues; he draws long convulſive ſighs; the pulſe flutters, and intermits from time to time, and he expires. The countenance is not of a tranſparent paleneſs, but of that clayey and leaden colour which the painter repreſents in aſſaſſinations and battles; and this toſſing of the limbs, which is commonly repreſented as the ſign of a fatal wound, is indeed ſo infallible a ſign of death, that I have never known any one recover who had fallen into this condition.

Fear and horror lead to ſuperſtition; and in ſtopping hæmorrhages many ſuperſtitions were practiſed. There was, in the dark ages of the 16th and 17th century, a groteſque mixture of philoſophy and magic; the phyſicians wiſhed to appear philoſophers, and to operate by natural powers; and yet their chief confidence was in charms and incantations. Philoſophy, ſuch as it was in thoſe days, they truſted to, only, when incantations failed. The iron ore Hematites was ſo named, becauſe they were perſuaded that the very touch of it would ſuppreſs bleeding: and Wolffius ſays, "Cur jaſpis tacto vulnere unde ſanguis prorumpit eum ſiſtat nondum novi." The reaſon of the ſingular effects of the ſympathetic powder, and other charms for ſtopping hæmorrhages, they durſt not inquire into, but they believed and wondered. They tied live toads behind the ears or under the arm-pits, or to the ſoles of the feet, or held them in the hand till they grew warm, in order to ſtop hæmorrhages. Some imagined that the toads operated by cauſing fear and horror; but all believed their effects to be very ſingular *; and Michael Mercatus ſays that this effect of toads is a truth, which any perſon willing to take the trouble, may ſatisfy himſelf of, by a very ſimple experiment; for "if you hang the toad round a cock's neck for a day or ſo, you may then cut off his head and the neck will not bleed a ſingle drop!" Wolffius, and Senertus, and Michael Mercatus, and Hoffman, and Gottfried Mæbius, and many others, do greatly commend the live toad! nor was there any thing that could come in competition with it; ſince nothing could be imagined more unnatural, abſurd, and offenſive, unleſs indeed it were the moſs which grows in a dead man's ſkull †. In ſhort they proceeded from folly to ob-

* Bufo narium hæmorrhagiæ metum invincibilem, ponat ſi vel pone aures per ſe applicetur, vel pugno includatur ut caleſcat, &c. In the Appendix to the Acta Acad. Leopoldino-Cæſar. Curioſor. a very great author, tells us of a man falling into a dangerous bleeding from the noſe in conſequence of a ſwan which was carrying a toad away to its neſt, having dropped it ſo unluckily, that it fell juſt upon the nape of the man's neck;—ex roſtro Ciconiæ in aere propter volantis delabente Rana.

† Wolffius was the firſt among the learned phyſicians of the 17th century who found out how this moſs was generated, or how to procure it eaſily—ipſemet ego non impoſſibilem, &c. adjuvabimus autem ipſius geneſis faciliorem ſi crania *ſuſpenſorum*, (for always a thief or a murderer was of moſt uſe to the phyſicians); in umbroſis locis ſeptentrioni expoſitis aut ſylvis reponamus, ſive pendula reddamus." And he adds, "Alias ſufflamen ſanguini proruenti infigere creditur etiam muſcus vulgaris," &c. "Some are ſo weak as to believe that common moſs will do, and that, when the Bears are wounded with arrows, they ſeek out ſome moſſy bank, pluck ſome of the moſs, and ſtuff it in, to ſtem the bleeding."

For ſuppreſſing hæmorrhagy the ancient and learned phyſicians uſed an amulet made out of the right ear of an aſs! A hare's fud had long been the favourite application to ſtop the hæmorrhagy of wounds!

ſcenity, and from obſcenity to blaſphemy, till they came to profane the moſt ſacred things*. Their philoſophical doctrine of Derivation and Revulſion was not unworthy of thoſe who believed in theſe charms. In hæmorrhagy they tried rather to divert the blood than to ſtop it directly; they applied cupping glaſſes near the open veſſels; put ligatures round the limbs, made ſtrong frictions; or opened a vein in ſome diſtant part of the body; they operated from right to left, not diagonally but according to the direct line of the body; if there was hæmorrhagy from the left ſide of the neck, they bled in the left ancle, not in the right; and for hæmorrhages from the right ſide of the head they bled in the right foot, (" et de latere dextro capitis ad pedem dextrum, non ad ſiniſtrum," Guido, page 171). Even down to our own days, tourniquets have been uſed for like purpoſes. Sometimes to keep in the blood, ſometimes to drive it out! In profuſe menſtruation, tourniquets have been applied round the thighs and arms

but the following notable improvement upon hare's fur is recorded by Ab Heer, Lib. I. Cap. 5. " Pilos e pube muliebri avulſos, inque nares virorum intruſos;—et e pube virili in fœminarum Nares immiſſos." The faſcinating verſes uſed by the German ſurgeons were ſhockingly blaſphemous:

Gelijk Chriſtus ſtil bleef Staan im Jordaan,
Alſo muſt ook dien bloede Staan.

* In thoſe days it was neither ſtyptics, nor medicines of any kind, but the Devil or our Saviour, that did all the good or harm in extraordinary caſes. They had many counts againſt the old one, " de perfidiis et de fraudelentia Satanæ," of Satan's tricks in crimping and hooking in young boys and ignorant women we have many ſad and long narrations in the works eſpecially of the Paracelſian Doctors. He was deſcribed in thoſe days, as lately by Mr. Lewis, with horns, and claws, and ſaucer eyes;—" but the ſtrangeſt thing of all is, upon his rump there groweth a great long tail, that uſeth to trail upon the ground as he goeth!"—Such were not the deſcriptions of the celebrated Wolffius, who differs from Mr. Lewis and the ſervant maids, in thinking that he does not always appear in this majeſty of perſon, nor fly always out of the roof in flames of ſulphur, that he ſhows himſelf ſome times in more familiar forms: " Conſtat alias etiam quod Beelzebub ſub forma muſcæ et araneæ facile compareat," and all to beguile the ſimple; " et ſimplicibus hominibus illa ſub ſpecie loco ſpiritus familiaris inſerviat;" and ſometimes he is, according to theſe writers (who ſeem to have been very familiars of his), ſtuck in a looking-glaſs, or a ſeal-ring, or pent up, like Aſmodeus, in a doctor's bottle; " Sic in Francia et Italia venales reperivi demones Vaſculis, ſpeculis, phialis, aut annulos alligatis aut incluſos;" ſold, I ſuppoſe, like crucifixes, for fivepence a-piece. There is, among the Perfidiis Satanæ, one very terrifying indeed, recorded by Wolffius, which might well frighten the boldeſt, " Que inter alia itidem quoſvis deterrere debet." " The devil one night ſtole away the muſter-roll of a regiment, and next morning the ſoldiers were all ſeen hanging in the air by their cravats." Demon militibus quibuſdam noctu ſubſtraxerit ſchedulas, vel carmina quibus ſe antea contra hoſtium, virtutem et vires crediderunt, et experti ſunt aliquoties munitos, (i. e. their Abracadabras), quo furto facto poſtmodum ii ſtrangulati in aerem elevati perierunt," p. 554.

to prevent fainting and weakneſs; and again, in ſparing or ſuppreſſed menſtruation, they have been applied to force the blood through the veſſels of the womb! De Goerter aſks not in ridicule, but ſeriouſly, An aligatis parvi articuli aliquid boni preſtat in hæmorrhagia? "I have ſeen this ligature of the Little Finger, ſays Goerter, practiſed by an old phyſician, who aſſured me upon his honour that he had often found it do infinite ſervice, which I firmly believe."

In hæmorrhagy, as in epileſpy and convulſions, and other horrible diſeaſes, they truſted more to incantations than to natural means, or they uſed natural means hardly leſs ſuperſtitious than incantations. None of theſe was more whimſical, nor more degrading to the regular profeſſors of ſurgery, than that of cutting up a live hen, and thruſting the bleeding member into it. Would you believe that this method of arreſting hæmorrhagy, which had been learned from the hangman, or rather, indeed, from the hangman's wife, was not only mentioned reſpectfully by ſo celebrated a perſon as Platerus, but actually uſed by him? "A vicious horſe having bitten off a man's thumb, and all kinds of things had been uſed to ſtop the hæmorrhagy, but in vain, I, when called, ordered a chicken to be ſlit up, and ordered him to thruſt his thumb into it, and keep it there while the fowl was hot;—his hæmorrhagy ſtopped in a moment*."

* The ſtory of the hen and the hangman's wife, which you have heard of but never perhaps authentically, nor with any proof of its belonging originally to ſo great a man as Platerus, is literally as follows:

"When I was at Montpelier," ſays Platerus, "the ſervant of a certain prieſt, who knew that he carried all his money, to the amount of good 200 crowns about him, watched him one night when he was ſitting by the fire roaſting a partridge; and, while he was twirling it about, came and knocked him down with a billet, and then was at the ſuperfluous trouble of cutting his throat."—"About a year after, the villain was taken, and condemned to be divided into quarters, for the benefit of the whole city; but before this he underwent the following initiating ceremony: He was carried to the ſquare where he had committed the murder, and there the hangman cut off the right hand with an axe;—but, leſt he ſhould die of the hæmorrhagy, the hangman's wife, in whoſe lap the thief ſat during all his progreſs, took a live fowl, which ſhe had provided, cut it up with a knife from the gut to the breaſt bone, thruſt the bleeding ſtump into it, and tied it firm, and hooped it on with garters like a boxing glove. He was dragged on the hurdle for a whole hour, before he arrived at the ſpot where he was to finiſh his career; and, to the admiration of Platerus, who followed him ſtep for ſtep, he loſt not one drop of blood!"

"Famulus Canonici Monſpeſſuli, cum illic eſſem anno 1554. qui hunc ſuum herum, noctu ad ignem ſedentem, et perdicem aſſantem, titione percuſſum, et cadentem, cultro jugularat et ſpoliarat, omne aurum ſuum quod 200 erat coronatorum ſecum portare ſolitum, ac poſt annum demum deprehenſus, ſupplicio adjudicatus, cum antiquam in quatuor partes divideretur, manum utramque in platea, in qua ædes ſitæ erant, ubi ſcelus hoc commiſerat, illi carnifex amputaſſet, ne ex larga hæmorrhagia moreretur, ſed vivus in locum ſupplicii ductus, illic in quatuor partes diſſecaretur, et proin ſanguinis ille vehemens fluxus impedi-

Such has been the dread of hæmorrhagy in all ages, and ſuch was the philoſophy, the religion, the medical ſkill of all Europe, in the 16th and 17th centuries; but the ancients, as I have obſerved, more cruel and daring, had uſed heated irons, both for ſtopping hæmorrhages, and for almoſt all the great operations of ſurgery. In Apoplexy, Epilepſy, and Palſy; in Melancholy and Madneſs; in Headachs and Hæmicrania, they cauterized upon the coronal ſuture with burning irons; they meaſured with the palm of the hand from the root of the noſe, and where the midfinger fell they cauterized, not ſuperficially, but down to the very bone, and they burnt through the firſt table of the bone, and afterwards ſcraped it ſo as to force it to exfoliate *! this they did after previouſly purging the brain. In Toothach, Ophthalmia, and Corryza, they burnt in the eye-lid, behind the ear, and in the nape of the neck. In Cough, Hoarſeneſs, Pleuriſy; in dropſies, ſwellings of the ſpleen, coldneſs of the liver, or coldneſs and moiſture of the ſtomach, (quando accident in ſtomacho frigus et humiditates multæ), they cauterized the belly and thorax. Whatever we perform with the knife, the ſaw, the cauſtic, or the needle, they did with cauteries. With the cautery they exfoliated bones; deſtroyed tumors, as in the Antrum Maxillare, or gums; dried up ulcers; ſuppreſſed fungi; reunited fiſtulas; cured diſeaſes of the hip-joint, and rheumatiſm and gout, and curvatures of the ſpine. It was in conſequence of this ancient doctrine that the practice of burning for the gout with moxa was ſo favourably received in Europe. They cured the piles, and obliterated varicoſe veins by burning them. They thruſt their burning irons through hydroceles and herniary ſacs, to obliterate them. The cauterizing iron was

retur, hac ratione, a ſubitanea morte, præſervatus fuit. Carnificis uxor, in cujus ſinu latro curru vectus ſedebat, gallum gallinaceum, vivum, interea cultro a podice verſus illius ſternum ſcindendo, aperiebat et brachium mutilatum, ſtatum poſt ictum, in hanc aperturam intrudebat, poſtea fune circumducta, alis complicatis arcte ligabat, ſicq. ſanguis in altum ſaliens, repreſſus fuit, adeo, ut nihil inde ſicuti diligenter, obſervavi, poſtea effluxerit, et ultra horam, donec interemptus fuit, non debilior factus ex mutilatione, vixerit."

This very valuable caſe Platerus follows up with the following head title:—"*Idem remedium, in digito præmorſo.*"

* "Deinde præcipe ei, ut radi faciat caput ſuum cum novacula. Deinde fac eum ſedere inter manus tuas quadratum, ita quod iam poſuit manus ſuas ſuper pectus ſuum. Deinde po ne radicem palmæ tuæ ſuper radicem naſi ſui inter oculos ſuos. Ubicumq. ergo pervenerit digitus tuus medius, ſigna locum illum cum incauſto."

"Et dixerunt quidam eorum, ut cauterizetur cutus uſq. ad os; et teneatur cauterium, donec aduratur quiddam ſpiſſitudinis oſſis. Deinde radatur poſt illud quod ad uſtum eſt ex oſſe, deinde curetur."

praiſed by Galen * moſt partially, " velut ſceptrum quoddam," as a kind of ſceptre with which they ſubdued hæmorrhages and reigned over diſeaſes; and the provinces which were held in ſubjection by this fiery ſceptre were of no ſmall extent; there was hardly any diſeaſe which fire could not cure! the chapters on the uſe of Cauteries in the ſurgery of Albucaſis are juſt fifty-eight in number; and the diſeaſes enumerated are, leproſy, dropſy, and almoſt all that the human body is ſubject to! Albucaſis ſeems to have been in the cuſtom of chaſtiſing and chaſing all rebellious pains from hip to hanch with this powerful ſceptre. He directs how to cauterize every individual part of the body †, from the head to the heel, " a capite ad pedes," maintaining his practice by very ſuitable doctrines ‡.

At the revival of learning, when the phyſicians of Europe were as yet little acquainted with natural ſcience, they merely tranſcribed their leſſons in medicine from the Greeks, Romans, and Arabians, and reſted entirely upon authority. Then every thing ancient was ſacred; they began indeed to find out other cures for ordinary diſeaſes; but hæmorrhages they oppoſed only with the heated iron, which was ſtill the ſceptrum ad reſtringendum fluxum ſanguinis. The learned of thoſe times were worſhippers of fire; and thoſe who ſeceded from this great doctrine were regarded as hereticks, as ignorant men, incapable of underſtanding the writings of the ancients, or of reliſhing their doctrines, and were hardly accounted as regular phyſicians. It was this deference for authority that ſupported ſuch unnatural and cruel practices; and it was by the learned phyſicians of France that Parée, the inventor of the needle and ligature, was ſo hardly uſed. They conſidered the hot iron, not as a mere cautery, but as an aſtringent; and actually believed that they improved the aſtringent power of their cauteries by heating and quenching them from time to time in red wine or ſtrong vinegar! In thoſe days the metal of which cauteries were to be formed, the degree of heat that was to be uſed, and the very ſhape of this ſceptre,

* Galen in Therapeuticis.

† " Et ego quidem jam ordinavi hoc Capitulum in Cauterio, ſecundum capitula: et ordinavi ea a capite uſq. ad pedes: ut allevient quærenti illud quod vult ex eo."

‡ " Dico ergo, quod cauterium confert univerſaliter omni complexioni, que eſt cum materia, et abſq. materia; exceptis duabus complexionibus, quæ ſunt complexio calida abſq. materia, et complexio ſicca abſque materia. In complexione autem calida et ſicca cum materia diſſenſerunt. Quidam enim dixerunt, quod Cauterium juvativum eſt in ea. Et dixerunt alii contrarium illius, ſcilicet quod Cauterium non eſt conveniens in ægritudine, que eſt ex calidate et ſiccitate: quoniam natura ignis eſt caliditas; et inconveniens eſt, ut ſanetur ex ægritudine calida et ſicca,—cum calido et ſicco!"

became important diſputations. Albucaſis had proteſted againſt the uſage of the ancients and of Avicenna, who made cauteries of gold. Albucaſis ordered the cautery to be heated to a white heat, (igneatur in igne dovec rubeat et projiciet Scintillas), a degree of heat which gold could not ſo well bear *. The more modern ſurgeons, in ſearing arteries with the heated iron, could not but obſerve that too hot an iron made a ſudden eſchar, which fell off as ſuddenly; they objected to gold, becauſe it did not indicate the degree of heat, and preferred iron, which marks the degrees of heat by the various colours it aſſumes. They were thus careful to regulate the degree of heat, becauſe when they applied the cautery too cool to the mouth of an artery, there was no eſchar formed, and it continued bleeding; when they applied it too hot, the ſlough or eſchar was apt to yield to the beating of the artery, and to fall off almoſt as ſoon as the cautery was withdrawn.

It was in thoſe times that the invention of a new cautery, or a new ſhape for the iron, was thought meritorious. It was then, alſo, that Fabricius ab Aquapendente, publiſhed his new method (which he claims as peculiarly his own) of cutting off a cancerous breaſt: "If it be a moveable cancer, I cut it away," ſays Aquapendente, "with a red hot knife, which ſears or burns as it cuts; but if it be a cancer adhering firmly to the thorax, I cut it, without either bleeding or pain, with a wooden or horn knife ſoaked in aquafortis, with which, having cut through the ſkin, I then do the reſt by digging out the gland with my fingers †." Theſe are methods really deſerving of the encomium which Mr. Dionis put in the author's name. "They have chiefly the merit, ſays Dionis, of hitting two birds with one ſtone." On ferait d'une pierre deux coups ‡." Guy de Chauliac writes both hiſtorically and critically on this very point. The cauterizing irons were of various forms (ſays he) among the ancients, but the moderns have limited their number. "William of Salicetus has but ſix or eight

* Liqueſcit in igne ut vertitur in laminas.

† Ego autem, etſi nil tale facere molitus ſum, ſi eſſem facturus, ut dolorem primo vitarem, et ſaniei profuſionem, ſi cancer ſit mobilis, ipſum forcipe hoc apprehenſo ſtatim cultro, uno eodemque tempore candente et incidente opus peragerem, ut forcipe valide conſtrigente ſenſus partes hebetur, cultro incidente amputetur cancer, et eodem candente ſanguis ſupprimatur. Quod ſi cancer mammillæ adherens et firmus ſit, neque ſtringi poſſit, excedendus omnino eſt, atque ad vitandum et dolorem et profuſionem, excederem cum ligno aut cornu, aciem habente intincto tamen ſubinde in aqua illa, qua aurifices ab argenteo aurum ſeparant, quam fortem vulgus nominat, quo tota cutis in circuita mammillæ incidenda eſt, poſtea digitis potiſſimum et unguibus mammillæ glanduloſa ſubſtantia à ſubjecta parte ſeparanda."

‡ Dionis, page 362.

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forms of the cautery. Henricus has ſeven only; Lanfranc has ten; but I myſelf have only ſix different irons!" a precious employment indeed for Gulielmus de Salicetus, Henricus Lanfranc, and Guido de Cauliaco, counting their burning irons *.

Without reading the books of the old ſurgeons, it is not poſſible to imagine the horrors of the cautery, nor how much reaſon Parée had for upbraiding the ſurgeons of his own time with their cruelties. A number of cauteries were heated in the fire at once; they were uſually of a conical form, ſo as to enter into the wound, and touch the mouth of the artery, without hurting much of the ſurrounding fleſh; they were brought from another room, for the ſurgeons were careful to hide this apparatus. They firſt ſtruck the cautery againſt the ſide of the grate, and then rubbed the face of it upon the floor. They clapped the point of the forefinger upon the mouth of the artery, twiſted it round and round, and took a ſecond and a third iron, when the firſt cooled. They turned and whirled the cautery thus round upon the mouth of the artery till the blood ſtopped; and in deep lying arteries they puſhed ſtrongly upwards in proportion as they twirled the cautery round! ſeeking to bury the artery deeper among the fleſh. They were careful not to dreſs the wound till the third or fourth day, leſt the eſchar ſhould fall off too early. I believe that more dexterity, and certainly more hardihood, was required in performing theſe operations than in uſing the needle †.

* "Inſtrumenta quibus fiunt cauterea actualia apud antiquos diverſa erant moderni, vero ea retraxerunt ad eortum numerum ut Gul. de Salicetis, ad ſex vel acto; Lanfranc ad decem Henricus ad ſeptem; ego vero Cauteria Communia faciebam cum ſex formis." Guido de Cauliaco.

Theſe various ſhapes of the cautries are to be ſeen in the chaffer of burning irons at the head of this chapter.

† "In uſing the actual cautery the ſurgeon ſhould be always furniſhed, of ſeveral ſorts, larger and ſmaller, with button, flat, and pointed extremities, for the better adapting them to the mouths of the veſſels, without hurting any adjoining nervous or tendinous part. As to the uſe of which there may be more judgment required than the younger artiſt is aware of; for if *perfectly red, or fire hot*, as we call it commonly, haſtily applied and inſtantly removed, it is odds but at the ſame time the *eſchar or cruſt is pulled off with the iron*, and the patient undergoes the pain to no purpoſe, the veſſel now again bleeding as forcibly as ever. When the ſame then is of a moderately glowing heat, being ſtruck againſt the grate, or ſide of the chafing-diſh, where the burning charcoal is kindled for that purpoſe, and rubbed againſt the floor; let it be *ſtrait clapped up to the mouth of the artery, carrying it however ſideways to the ſame, that the blood flowing out againſt or upon it, may not damp the heat*: At the ſame time let the end of the cautery be turned two or three times round about againſt the bleeding part, with expedition; ſtill obſerving upon each touch, whether the work is done complete, whence you may renew or withdraw wholly your inſtru-

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The horrors of the patient, and his ungovernable cries, the hurry of the operator and assistants, the sparkling of the irons, and the hissing of the blood against them, must have made terrible scenes, and surgery must in those days have been a horrid trade *.

For one wound, and especially for the amputation of a limb, many cauteries were required. Parée, in his spirited reply to Gourmaline, says to him, "If, Sir, in a siege, or in the assault of a city, where hundreds of soldiers have their limbs shattered, you should choose to cauterize with burning irons, you would need a page to run backwards and forwards with your irons, and furnaces to heat them in; and I should little wonder, if, in the end, you were to be dragged out and stoned, as happened to Agatheus, one of the earliest surgeons in Rome †."

From actual cauteries it was natural to proceed to use substances which had a similar operation, as caustics, stimulant applications, and hot oil; and as these took place of the heated irons, it was natural to call them POTENTIAL CAUTERIES; in this rank were many fluids, which had no other effect than as they were hot; even melted sulphur was used, and melted lead, and boiling oil, the temperature of which is equal to melted lead; but the boiling oil of turpentine, was the favourite application. Kettles of boiling turpentine were kept in readiness in the cock-pit during a battle at sea, and in hospitals where great operations were to be performed; but their chief potential cautery was blue vitriol, which was applied in the following manner: The vitriol was pounded grossly (not very small), it was wrapped up in a linen rag; this little bundle,

ment, conveying the same, as it was brought you, handsomely out of your patient's sight, and dress up with lenients, as is required in other ambustions."

"But where the artery, although its impetus be taken off, continues bleeding after this, you may give the eschar a touch more, or the heat decaying and proving insufficient, having a second iron always ready in the fire in another room, or behind your patient, in the chimney of the same; therewith finish what remains, observing the same in the application of the first."

* "Your patient, says Turner, especially if a woman or child, or a woman with child, should never be suffered to see your irons, or, if possible, to know any thing of them; for which end it is necessary that the face be covered at such times, and the part held steady by a servant, or some proper assistant, among which some of your own fraternity are the fittest." Page 528.

† "Ioinct que si aujourd'huy apres un assaut de ville où plusieurs soldats ont eu bras et jambes rompuës et emportées de coups d'artilleries, ou de coutelas, ou d'autres machines pour estancher le sang, vous falloit user de fers ardans, il faudroit pour ce faire une forge et beaucoup de charbon pour les chauffer, et aussi que les soldats vous auroient en tel horreur pour cette cruauté, qu'il vous assommeroient comme un veau, ainsi que jadis fut l'un des premiers chirurgiens de Rome."

like a waiſtcoat button, was what they called a button of vitriol; and the blood being for a moment ſuppreſſed by the tourniquet, this vitriol button was placed carefully upon the mouth of the wounded artery. The tourniquet was let go, after ſome interval of time, and very ſlowly. The exuding of the blood diſſolved the vitriol ſlowly. This cauſtic affected the artery, made an eſchar like that of the actual cautery, which fell off after ſome days. The ſame precautions of unſcrewing the tourniquet ſlowly, &c. were uſed in dreſſing the wound, which was ſeldom opened up till the fourth or fifth day.

We are to judge of theſe cauteries, boiling oils, vitriols, corroſive ſublimate, and other cauſtics *, not by the horrors of the operation, nor the tranſitory pain of the moment, but by future conſequences, for the patient was continually expoſed to hæmorrhagy. The eſchars might looſen too early, and of this accident, and of the ſudden hæmorrhagy which followed, thouſands died; while few eſcaped a dangerous loſs of blood, and repeated cauterizing for many ſucceſſive dreſſings. In wounds, the bones and tendons were expoſed, the muſcles waſted, and the arteries themſelves ſloughed to a great extent, bleeding as long as the patient's blood retained any colour. And in amputations, the fleſh was waſted, the bone projected, and the ſtump was pyramidal and could not be cloſed. Is there any wonder that the diſcovery of ſome ſtyptic or effectual aſtringent of the veſſels was greatly deſired? or that the meaneſt pretender attracted notice? or that thoſe few medicines which ſuppreſſed hæmorrhagy, though but in a very imperfect degree, procured for the inventors public rewards?

The tranſition was natural, from corroſive ſublimate, cauſtics and vitriols, to the milder metallic ſolutions, which then loſt the name of potential cauteries, and were obtruded in various diſguiſes under the title of Styptics and Aſtringents. The chief ſtyptics have been acids, ſolutions of vitriol, turpentine, and various ſolutions of aſtringent gums in ſpirits of wine. Theſe were invented by the regular phyſicians, and had their ſucceſſes in ſlighter hæmorrhages; and always the hope was indulged of finding out ſome aſtringent ſufficiently powerful to ſuppreſs even the bleeding from an amputated limb. This eaſy and credulous temper of mind in men of our profeſſion has left the public very much expoſed to the practices of quacks. We know by long experience, and many diſappointments, the inſignificancy of thoſe drugs which have been produced

* We are told in Young's Currus Triumphalis, of nineteen men being cruelly deſtroyed by uſing corroſive ſublimate for reſtraining the hæmorrhagy.

from the vegetable or mineral kingdom to ſerve as ſtyptics; we know them to be of little uſe farther than to check any ſlight bleeding of the noſe or gums. We no more expect any acid, ſpirituous, or ſaline body to act as a ſtyptic without cauſing pain, than we would expect Digby's ſympathetic powder to act at the diſtance of many leagues. We know that the chief ſecrets of empyrics have been the neglected inventions of old phyſicians. We have never heard of any ſtyptic which was not proved in the end to be a ſolution of vitriol, or a ſpirituous ſolution of ſome aſtringent gum!—What ſhould we expect from the random inventions of ignorant people, whoſe ſole trade is that of cheating the public, and whoſe only ſkill is that of contriving and managing the deceit? From the time of Rewbell to the celebrated Ruſpini, we have found diſappointment following quick after each fit of expectation; and though many attracted, by the proſpect of public rewards, have impoſed for a little while; though their ſtyptics have for a day borne an ineſtimable value, yet always the charm has vaniſhed with the ſecret! Such ſtyptics have no ſooner been bought by the King and Parliament, and publicly prepared; they have no ſooner been dignified with the high ſounding titles of Royal Styptics, Aqua Styptica Regalis, &c. &c. than they have been rejected and deſpiſed.

Rewbell was a German chemiſt, and, having gone up to Paris with his ſtyptic, he ſo wearied the King, and Mr. Louvais, with entreaties and ſolicitations, that, after long attendance, he obtained leave to uſe it upon one of the ſoldiers in the Hoſpital of Invalids. This poor man's leg having been amputated in the uſual form, the ſurgeons and phyſicians of the hoſpital delivered him up to Mr. Rewbell, who had hardly finiſhed the firſt application of this ſtyptic, before the blood came draining through all the dreſſings. He doubled the doſe of his ſtyptic water, dreſſed his ſtump firmly a ſecond time, but ſtill the blood flowed *; ſo that in a little while, and in preſence of all the aſſiſtants, the unhappy ſubject of this cruel trial died under his hands; either they had not had that fear, which they ſhould have had for the patient's life, or they wanted humanity or reſolution enough to ſtop this horrid experiment; but they made ſome amends by procuring an order from the King, prohibiting Rewbell, under the ſevereſt penalties, from repeating this attempt.

We have ſeen the lateſt of theſe inventions, Ruſpini's ſtyptic, tried in this

* This Eau de Rabell, ſo famous in France and Germany, was juſt a mixture of ſtrong ſpirit of vitrio and ſpirits of wine.

place, where I believe it is eſteemed as of much the ſame value with the ſympathetic powder of that famous knight, and moſt complete gentleman, Sir Kenelm Digby; which ſympathetic powder ſtaunched the blood, as effectually when it was applied to the weapon, as when applied to the wound itſelf *.

This country has never been behind hand in credulity, nor in public liberality. About ſixty years ago, Turner obſerves, " That among liquids there are blood-ſtaunches of great variety, every empyric now boaſting of an infallible ſtyptic."—" In the reign of King Charles the Second, Mr. Denys's Eſſence made great noiſe among us, many experiments being tried therewith by Dr. Walter Needham and Mr. Richard Wiſeman, as well on brutes as human bodies, ſeveral of the court phyſicians and principal ſurgeons being preſent, the King himſelf alſo a ſpectator at ſome of them, and declaring his ſatisfaction in the ſame; upon which Monſieur Denys was deſired (but not without a princely reward) to communicate his ſecret, which was prepared in the Royal Laboratory, and after uſed with very great applauſe, under the title of STYPTICUM REGIS; yet quickly after the ſecret taking air, the ſame began to be overlooked, and little ſet by, which put another Secret-Monger upon publiſhing one not half ſo good, as was proved by that faithful and judicious practitioner Mr. Cowper, in the hoſpital of St. Thomas, Southwark; who, notwithſtanding the differing character given it by the author, declared it a moſt painful and violent cauſtic, at the ſame time ineffectual in the end of its application."

" However, when our people had run a-madding ſome time after this new lunary, a purchaſer was met with (much good may do him with his bargain) on whoſe hands, I doubt, the commodity goes heavily off, eſpecially ſince another wonder-working-whim for the ſame intention is put up to a ſale; which, notwithſtanding a quondam firſt rate phyſician has been fautor thereunto, I muſt do that

* This I believe is the ſame knight, whoſe gallantry and loyalty carried him to ſuch exceſs, that he burſt the arteries of his legs, ſo as to form aneuriſms, by kicking open the doors of the den, in which the boar was confined which the king was to hunt: but whether his aneuriſms needed to be opened, or whether he uſed his ſympathetic powder, or whether he applied it to the door, or to his own hams, the German writer who tells this ſtory does not declare.

" Vidi equitem Digbeum, amicum intimum, egregium philoſophum, chimiſtam, cujus præſcripta medica curioſa typis mandata Pariſiis, a Trefelio mihi dicata fuere; exortæ illi fuere venæ et arteriæ variceformes in tibiis, cum pedum impulſu conaretur infringere fores ſepti ferarum, quibus Rex Angliæ adſtabat, quocum venatum ibat: Forte contigit in eo occurſu et tunica arteriarum media crepuerit, ipſa autem arteria admodum dilatata; tunc temporis tumor longitudinem arteriæ inſequitur, in extenſione vim patientis."—Zodiac. Med. Gall. p. 45.

juſtice to the public, to declare, in thoſe few trials I have made therewith, I found it what the people call a chip in pottage; and, I fear, whoever ſhall lay a ſtreſs on the ſame in amputation, or reſtraining any forcible hæmorrhage from the arteries of human bodies, eſpecially the adult, *will be found to do little better than trifle with men's lives*. The firſt time I had ſight of this medicine, and tried it upon my tongue, I was abſolutely certain it was a ſolution of ſteel, which was farther confirmed by ſome other trials I made uſe of *."

Societies for the improvement of natural ſcience had been eſtabliſhed in England and France; and it was well known that the diſcovery of a good ſtyptic was a benefit for which the public would not be ungrateful; and that any invention worthy of the patronage of thoſe ſocieties would enſure the Royal bounty.

It was about the end of the year 1750, that Mr. Broſſard, a ſurgeon in Berry, went up to Paris with the hopes of ſelling a remedy, which he ſaid was perfectly effectual in ſtopping, not only the hæmorrhagy of wounds, but that of an amputated limb. At his requeſt a committee of the Academy of Surgery being appointed, he performed in their preſence many experiments upon dogs and other animals. The moſt perfect ſucceſſes of this kind could not be conſidered as deciſive, becauſe dogs and leſſer animals never die of ſuch bleedings; but they were ſuch as to entitle the academicians to allow of bolder trials †. He was allowed to try his remedy in the Hoſpital of Invalids, where he perfectly ſucceeded in ſtopping the hæmorrhagy, after an amputation of the leg; and Mr. Faget having two patients in La Charité, with legs much cruſhed by a waggon loaded with ſtones paſſing over them, he amputated both legs, and in both Mr. Broſſard ſuppreſſed the bleeding. Both of them died ſome days after, but not of hæmorrhagy ‡.

* Turner's Surgery, page 338.

† "Trials of ſtyptics on the bodies of quadrupeds have been commonly practiſed to commend them to the public; but it is not without cauſe that pretenders to ſuch remedies have made choice of younger animals, as dogs and calves, &c. for that purpoſe. But ſince the only ſtandard for their uſe is their ſucceſs on human bodies, we ought to make our experiments on thoſe animals, whoſe magnitude and age bear a proportion to it; for nothing is more obvious in wounding the arteries of living animals, than that the protruſion of their blood bears a proportion to their bulk; and in diſſection, the arteries of the fœtus are remarkably thinner than thoſe of an adult, and thoſe of an aged perſon grow ſtill thicker, and frequently become cartilaginous, and at length entirely bony, of which Dr. Tyſon and myſelf have ſeveral pieces." Cowper.

‡ The one died on the 5th, the other on the 9th day. The arteries were ſo contracted near their

This invention of Mr. Broſſard's was the agaric of the oak *, a fungus which grows upon the oldeſt trees; it is gathered in Auguſt or September after the greateſt heats; and it is prepared by long keeping in a dry place, by cutting away the outſide rind, and beating it till it ſoften, ſo that it begins to yield and can be torn with the fingers; it is of the colour and appearance of ſhamoy leather, and in the country parts of Ireland it is actually called oak leather. It was cut into ſmall pieces, which (the tourniquet being firm ſcrewed) were fixed upon the mouths of the bleeding arteries, were ſupported by compreſſes, and bound firm down in the wound, or upon the face of the ſtump, by a fillet, which was paſſed up along the limb. It ſucceeded often in the hands of Meſſieurs Faget, Bouquot, Morrand, and other great ſurgeons of Paris.

Though the uſe of the agaric in hæmorrhages had actually been mentioned by Felix Wurtzius a hundred and fifty years before, yet Mr. Broſſard was liberally rewarded by his Moſt Chriſtian Majeſty. Pieces of prepared agaric were ſent, with a reſpectful letter, from the French Academy to our Royal Society, by them it was committed to Mr. Warner, who made various experiments with it, generally ſucceſsful; and he cloſes his remarks with this ſenſible obſervation, That the agaric is ſtill more uſeful in old and ulcerating wounds, and in ſtumps where the rottenneſs of the fleſh prevents the needle being uſed, than in amputations, or recent wounds. This diſcovery was thought to be perfect. Mr. Faget, in his enthuſiaſm, believed that the needle was to be ſuperſeded by the agaric; the diſcovery was in this country alſo a ſubject of great exultation. The virtues of the agaric were equally extolled in the French Memoirs and in our Philoſophical Tranſactions; it was reckoned to be not merely a ſponge, but an aſtringent, having very ſingular properties in contracting the veſſels; and one Societarian, ſuſpecting that it might be equally uſeful in internal hæmorrhages, BOILED IT †,"

mouths that Mr. Faget could hardly introduce the ſmalleſt probe into them, which gives occaſion to a very fine diſſertation, of no inconſiderable length, upon the power the agaric poſſeſſes of cauſing arteries to contract.

* The names of it are, Amadoue, agaric of the oak, fungus orbicularis, fungus igniarius, or touchwood, lycoperdon, boviſt, veſſie de loup, agarie de chene, mullipuff, puff ball, &c.

† The chief papers, upon this ſubject of the uſe of the fungi, as puff ball, agaric, fungus vinoſus (a fungus that grows in wine cellars), &c. may be ſeen in the Philoſophical Tranſactions, or in the Academy of Sciences, about the year 1756; and there will alſo be ſeen, ſome indications of the confuſed notions they had about theſe fungi; conſidering them not merely as ſponges, but as containing ſome hidden inexplicable virtue in reſtraining hæmorrhages; this is beſt underſtood by the experiments of one man, who reſolving to be very wiſe,—or like a true SOCIETARIAN—(as Dr. Hill would have ſaid), BOILLED IT!! "I

like the German peaſant, who, in place of carrying the doctor's preſcription to a laboratory, rolled it up and ſwallowed it *.

Yet in uſing the agaric much depended on the manner in which it was ſupported! on the tourniquet being kept firm till it had adhered, on the tourniquet being ſlowly let go, on the neat compreſſes which were held over it, and on the bandages with which the whole was ſecured. With every precaution it did fail ſometimes. Warner, after the flattering reports which he at firſt gave of it, truſted too much to it in an amputation of the thigh, where it failed; it failed often in the hands of the moſt able ſurgeons; it fell at laſt into diſuſe; and the leaſt that we can ſay of this diſcovery, ſo hyperbollically praiſed, and ſo highly rewarded, is, that had it been invented in the days of Celſus, when they were cutting off limbs, not with the aſſiſtance of the tourniquet, but by the gripe (i. e. by aſſiſtants graſping the thigh), when they were ſearing the arteries with their burning irons! it muſt have been of infinite value, and have ſaved many lives; but coming as it did in competition with the needle, it muſt have delayed the general uſe of the needle, it muſt have endangered many lives, and was in no reſpect worthy of the high praiſes beſtowed upon it by the Academy of Surgery, nor of thoſe liberal rewards which the King of France beſtowed upon Mr. Broſſard. The privilege of rewarding merit is a high one; but I fear that ſuch rewards are rather a general bribe, for the concealing of uſeful inventions; while an invention really uſeful, will always be in the ſame degree honourable; and, in our profeſſion, will reward itſelf.

The SPONGE, which has been uſed chiefly by the celebrated Mr. White, is more uſeful than the agaric; it is like it in its operation, is really of value in practice, not to take the precedency of the needle, but to aſſiſt it. The ſponge

have tried it, ſays this gentleman, in female caſes, with *great ſucceſs*, by injecting a STRONG DECOCTION of this fungus into the womb, in hæmorrhages from the womb, and eſpecially in fluxes, after delivery." Vid. Philoſophical Tranſactions, p. 265.—He had better have injected a STRONG DECOCTION of Album Græcum.

* The ſtory is told by Denſingius. " Dr. Nicholaus Muller having written a preſcription for a country fellow, deſired him to divide it into three equal doſes, very accurately, and take one every morning in a cup of ale; the poor fellow's head ran on nothing but charms and incantations, and he conſidered Nicholaus Muller as a being very ſuperior to a mere doctor. In a few days the man returned with a hen's egg in a baſket, as an offering to the doctor. Muller now perceiving the extreme ſimplicity of the fellow, aſked him whether he had taken the medicine faithfully? very faithfully, ſays the clown, I tore it into three pieces, as like one another as peaſe, and took one every morning faſting; and now, thank God and your Honour's goodneſs, I'm pure well.'

can be very thoroughly dried, it can be compreſſed into a very ſmall compaſs, it can take any ſhape, and may be thruſt down into cavities and narrow wounds where the needle cannot go; it can be made ſo hard, and preſſed ſo firm by laying compreſſes over it, as to have at once the effect of a compreſs and of a ſponge; or rather of a compreſs having this curious property, that at firſt it preſſes moderately, but if one drop of blood eſcapes, the compreſs ſwells by abſorbing that blood, ſtill preſerves its contact with the bleeding artery, and ſwells more, and preſſes harder, exactly in proportion as ſuch preſſure is required. This is plainly the effect of a ſponge, whether it be nitched in betwixt two bones to compreſs an artery which the needle cannot reach; or whether it be laid flat upon an open ſore, as after cutting out the breaſt; or after an amputation done according to the old faſhion, where the ſurgeon uſed to dreſs his ſtump open, and to heap compreſſes tied with a firm bandage above each piece of agaric or ſponge. The agaric poſſeſſing a degree of this property is of uſe; even our common lint poſſeſſes this quality of abſorbing and ſwelling in a ſlight degree. But the agaric and ſponge are both ſo excellent in this reſpect, that even thoſe who are the leaſt inclined to uſe them, muſt acknowledge, that though the agaric will often fail, it has yet enabled ſurgeons to perform the greater amputations ſafely. And the ſponge, as is proved by Mr. White's Practice, is the only thing that can ſtand by the ſide of the ligature to aſſiſt it. I am ſenſible, that by thruſting down a ſponge I have ſaved a patient's life, when I could not have extricated myſelf by any nicer operation.

I am next to explain to you the diſcovery of the needle and ligature for ſtopping arteries, a diſcovery which has raiſed Paræus to a rank not inferior to that of Harvey, which nevertheleſs has been neglected for nearly two hundred years! Shame to ſucceſſive generations who have diſputed about its merit, who have vilified the author, contemned his invention, and prevented the improvement of their own ſcience. This unwillingneſs to uſe the needle proceeded from the jealouſy and literary pride of the phyſicians of thoſe times. Delighted with the abſurd learning which they cultivated, and attached to their Greek, Roman, and Arabian maſters, they were worſhippers of the ancients, and of their doctrine of fire. They were intollerant and revengeful; they claimed to be the legitimate repreſentatives of the old ſchools; they would rather cauterize arteries with the ignorant and brutal Albucaſis, that Arabian farrier, than tie them with Parée, the firſt ſurgeon of Europe, their contemporary.

Paræus was body ſurgeon to four ſucceſſive kings of France. His talents for his profeſſion were excellent. He had been diligent in anatomy; he had lived in the Hotel Dieu for three years; and, in the turbulent reign of Henry the Fourth, he was in every ſcene of danger. He was indefatigable in his profeſſion; he was proud of it; he maintained it againſt the College of Paris. His high fame deſcending thus for ages, muſt make you deſirous of knowing the real character of the man; and there is no one point upon which his character turns ſo much as this ſingle invention: for of all his improvements, this of tying arteries was that of which he was proudeſt; he ſays, with the true enthuſiaſm of genius, "For the good of mankind, and the improvement and honour of ſurgery, I was inſpired by God with this good thought." And as it was the higheſt of all his improvements, it was that for which his enemies envied him the moſt.

The fortune of Paræus was very ſingular; he was at once the chief ſurgeon, the counſellor, and the private and familiar friend of four ſucceſſive kings of France. He attended them in their retirements and looſer hours; he followed them in the field, through all the dangers which were in thoſe days part of the duties of a king; and which his writings diſplay to us, with a faithfulneſs and a minuteneſs of deſcription which the hiſtorian ſhould hardly diſdain. He had the good fortune on one occaſion to ſave manifeſtly the life of the king, when his arm had been ſo hurt in bleeding, that it was three months before Paræus could accompliſh the cure. He was a man of ſuch rare abilities, and ſo much valued by the king, that he alone was ſaved alive in that horrid maſſacre of St. Bartholomew's day, which remains an eternal blot upon the French name.

But of all his good fortune, this is the moſt remarkable, that it was he alone, who, by his influence over the king, put a ſtop to this unparalleled butchery, after it had continued in all the quarters of Paris during two days.—The horrors of the king after thoſe dreadful days of carnage and moſt ſacrilegious murder, and the familiar and even tender manner of his complaining to Paræus, are told by the Duke de Sully very feelingly! for Sully was himſelf of the Reformed religion, and though yet a child on the day of the maſſacre, eſcaped with difficulty.

* "The hour is now come, ſaid the king, when all France ſhall be of one re-

* "Que ce Prince lui ayant dit le jour du maſſacre, qui c'etoit à cette heure, qu'ilfalloit que tout le monde ſe fit catholique. Parée lui repondit ſans s'etonner: Par la lumiere de Dieu, Sire, je crois qu'il vous ſouvient m'avoir promis de ne me commander jamais quatre choſes; ſçavoir, de renter dans le ventre de ma mere, de me trouver a un jour de bataille, de quitter votre ſervice, et d'aller à la meſſe." Le Roi

ligion." "Now, by God's light, Sire, (replied Paræus, nothing alarmed), I think you will never forget your promiſe to me, that there was four things you would not force me to do:—To enter again into my mother's womb;—to go out in the day of battle;—to leave your ſervice;—nor, to go to maſs.—The king then took him aſide, and opened up to him the troubles with which his ſoul was diſquieted. "Ambroſe, ſays he, I know not how it is with me, but it goes ſo heavily, that within theſe three days I am as in a fever; indeed I am ill, in mind and in body; ſleeping or waking, the murdered Hugenots are ever before my eyes, with hideous faces weltering in their blood. Would to God the children and the aged, at leaſt, had been ſpared!" The order for ſtopping the maſſacre, which was proclaimed the following day, was the reſult of this converſation.

There had long been an open war, about privileges and dignities, betwixt the ſurgeons and phyſicians; and that was one cauſe of ſettled malignity and diſcontent *. That Paræus, a ſurgeon merely, ſhould venture to write ſo large a book on ſurgery, and ſhould make it, according to the groteſque taſte of that age, a good and learned book, was high matter of jealouſy and offence, and for this reaſon was Paræus accuſed of ignorance in the Latin language, and of hiring young phyſicians (as if young phyſicians ſhould be more capable in ſurgery than old ſurgeons), to write his books. That Paræus's abilities ſhould have raiſed him to ſtations of honour, or made him thus familiar with a race of princes not too apt to condeſcend, was a ſore grievance to all his enemies, or which is the ſame, to all the phyſicians; but more eſpecially, to ſuch a man, and ſuch a phyſician as Gourmaline, whoſe taſte in learning and in manners, and whoſe habits of mind, are beſt explained by the language with which he aſſaulted Paræus.

"It was then very forward, raſh, and preſumptuous in a certain perſon, to venture upon condemning the cauterizing of bleeding veſſels (after cutting off a mortified limb), a method ſo highly and continually commended and approved

le prit a part, et s'ouvrit a lui ſur le trouble dont il ſe ſentoit agité. "Ambroiſe, lui dit-il, je ne ſçais ce qui m'eſt ſurvenu depuis deux ou trois jours; mais je me trouve l'eſprit et le corps tout auſſi émus, que ſi j'avois la fievre. Il me ſemble a tout moment, auſſi bien veillant que dormant, que ces corps maſſacres ſe preſentent a moi, les faces hideuſes et couvertes de ſang; je voudrois bien qu'on n'ey eut pas compris les imbeciles et les innocens." L'Ordre qui fut publié le jour ſuivant de faireceſſer la tuerie, fut le fruit de cette converſation."—Sully, Liv. I. p. 3

* By your good will (ſays Paræus to one of thoſe perſecuting phyſicians), by your good will, Sir, I think you would not have a ſurgeon even to order a ſimple poultice. Vid. page 781.

of by all the ancients; teaching in oppoſition to that, without any authority, without knowledge, without experience, without good ſenſe, ſome new method of his own, of tying arteries and veins." And in the end, he proceeds to call him carnifex, and other names, which it is needleſs to repeat *.

Theſe were perſecutions which the College of Paris was not aſhamed to avow. They claimed the privilege of licenſing books, and ordered this public proſecution of Paræus by their preſident Gourmelen. They would have ſuppreſſed this method of tying arteries, ſo heterodox did it appear in their eyes, and ſo entirely oppoſite to the methods of Galen and Celſus. They won their cauſe, but Parée declined the authority of the Parlement; aſſerted the privilege of his own profeſſion, it was however only by advocating his cauſe that he ſucceeded; for he appealed to the Court, and it was by a violation of the uſual forms that he was enabled to publiſh his book †.

Not ſatisfied with the licenſed attrocities of Gourmelen, whom they had appointed to proſecute Paræus in the courts of juſtice ‡, the College ſet upon him another hound of the ſame pack, one B. Comperat de Carcaſſone, a pupil of Gourmelen, more malignant, dull, and wicked, if poſſible, than his maſter. Theſe phyſicians pretended to deſpiſe Paræus as an ignorant man; and behold this Comperat, Gourmelen, and the very College they belonged to are remembered only by their invidious perſecution of Paræus. They contrived to faſten upon him

* Male igitur et nimium arroganter, inconſultus et temerarius quidam, vaſorum uſtionem poſt mortui membri reſectionem, a veteribus omnibus plurimum commendatam et ſemper probatam, damnare auſus eſt: novum quendam deligandi vaſa modum contra veteres omnes medicos ſine ratione experientia, et judicio, docere cupiens, nec animadvertit majora multo pericula ex ipſa vaſorum deligatione (quam acu partem ſanam profunde transfigendo, adminiſtrari vult) imminere, quam ex ipſa uſtione.

† "Les Docteurs en Medecine de Paris, voulans maintenir le droict, qui leur eſtoit acquit par un arreſt notable donné le ſecond jour de May mil cinq cens trente-cinq, Monſieur le Preſident Lizet ſeant, portant defenſes à rous les ſubjets du Roy de ne faire imprimer, et à tous Libraires ou Imprimeurs de n'imprimer aucuns liures en Medicine, qu'ils n'euſſent premierement eſte veus, viſitez, et approuvez par les Docteurs en Medecine de Paris, donnerent charge à Monſieur Gourmelen, qui eſtoit leur Doyen, de prendre garde que tel Liure ne fut mis en vente, que premierement ils n'en euſſent donné leur aduis, pource qu'ils eſtoient bien aſſeurez que telle marchandiſe ne pouvoit ſortit du Magazin de M. Ambroiſe. Monſieur Gourmelen, pour s'acquitter du deuoir de SA CHARGE, Y EMPLOYE TOUS LES MOYENS DESQUELS IL SE PEUT ADUISER: tellement que M. Ambroiſe, qui craignoit la cenſure des Docteurs en Medecine, fit tant par ſes menées qu'il fit playder la cauſe devant le cour de parlement."

† "Il a eſte picqué de ce que la faculté de Medecine a la purſuit de Mr. Gourmelen, lors doyen de ladite faculté c'eſtoit oppoſé a la publication de ces Oeuvres en Chirurgie, devant qu'elle en euſt donné ſon advis ſuivant les amiens arreſts de la cour de parlement, &c.

the moſt injurious accuſations: "He was not contented," ſays Comperat, "with teaching ſurgery, but entered alſo into the higheſt points of philoſophy: yet I will correct myſelf, ſays Comperat! He entered into no ſuch high points of philoſophy and medicine; he bought theſe diſſertations of various learned men, and had them tranſlated into Latin, in order to make exhibition of his learning to foreign nations."

What were theſe higheſt points of philoſophy which Paræus was accuſed of meddling with? The points of philoſophy are admirably enumerated, indeed, by this very Comperat. He diſcourſed (ſays Comperat) of elements, temperaments, humors, faculties, actions, and nervous ſpirits,—of ſperm, and blood-menſtrual; and of the cauſes and ſigns of conception; and of the formation, motion, and completion of the fœtus *." But who was it that diſgraced the books of Paræus with this wretched affectation of learning? The phyſicians of Paris, whom he had very unwiſely employed to adorn his book, which they performed in ſuch a ſtyle that it looked more like the work of the learned College and Dr. Gourmelen, and his pupil Comperat, than of the manly and ſenſible Paræus.

"Had Paræus compoſed his Caſes without the help of phyſicians, and publiſhed his ſurgical operations and conſultations, and all the fruit of his experience, in one ſmall volume, his fame, like that of Hildanus, would have gone down unblemiſhed to the lateſt poſterity †." But his obſervations are ſcattered, through the monſtrous Folios of thoſe hireling phyſicians; and yet

* "Il voulut entrer en diſcours des hauts poincts de Philoſophie et Medecine, comme des Elemens, temperamens, humeurs, facultez, actions, eſprits, pour introduire le jeune Chirurgien en la connoiſſance de la Chirurgie: comme s'il luy eſtoit neceſſaire pour entendre les beaux poincts de ſa profeſſion d'entrer en conſideration des hauts myſteres de la Philoſophie naturelle. De meſme il fait pour luy apprehendre à tirer le petit enfant du ventre de ſa mere, quand telle occaſion ſe preſente, diſcourant du ſperme, du ſang menſtrual, des cauſes et ſignes de la conception, et des diures temps eſquels l'enfant reçoit ſa figure, ſon mouvement, et ſon accompliſſement."

† "Ponam in prima acie Gabrielem Fallopium, qui tamen et ipſe ad lyram Guidonis ſaltavit." "Huic ſubjungo Ambroſium Paræum, ſed qualem virum! Regum Galliarum, Chirurgum petitiſſimum, qui ipſo rerum uſu, graviſſimorumque caſuum occurſu edoctus, artem valde locupletavit: interim ſcire oportet, ingens illud volumen, quod ipſius nomen in fronte gerit, ab aliis Medicinæ Doctoribus Pariſienſibus concinnatum fuiſſe, quibus amplam ſegetem exemplorum Chirurgicorum Paræus ſuppeditavit, quibus alii formam induxerunt; imo, ut in majorem molem opus excreſceret, *multa ſuperflua et a Chirurgico inſtituto aliena adjunxerunt.* Profecto melius expertus ille vir ſuæ famæ conſuluiſſet, ſi ſingulares curationes et rariorum affectuum obſervationes, atque remedia, infallibili uſu et tot annorum experientia ipſi comprobata, parvo volumine comprehenſa edidiſſet in lucem: ut fecit ſane, magna cum nominis ſui gloria Guilelm. Fabr Hildanus, Germanorum decus eximium, et cujus famam ſera poſteritas loquetur."—MIKPOTEXNH. 526.

that ſalt, ſo ſparingly ſprinkled, has preſerved the corruptible maſs for nearly two hundred years. Theſe learned compilers have made his book, what it is, a Syſtem of anatomy, a Compendium of ſurgery,—a Diſpenſary of drugs, chemical and Galenical,—a collection of caſes,—and a hiſtory of travels and voyages, by ſea and by land! By them has the text of Paræus been adorned with the moſt incredible tales! and the margins of his book with the moſt uncouth drawings of birds and beaſts, and comets, and monſters, and men-monkeys, and women-fiſhes! Never till then was the monſtrous compoſition which Horace derides, actually and unequivocally fulfilled:

" Humano capite cervicem pictor equinam,
Jungere ſi velit et varias inducere plumas;
Undique collatis membris ut turpiter atrum,
Deſinat in piſcem mulier formoſa ſuperne."

In his Voyages we find pictures of the Whale, and the Crocodile, and the Haiit and the Huſpalin, and ſuch extravagancies, that it is difficult to conceive how the various monſters could be imagined even by the moſt diſordered brain. But all this has nothing to do with the ſurgery of Paræus! this is the work of the young phyſicians, the compeers of Comperat and Gourmelen! this is their learning! they have made this book of Parée's a Mare-Criſium *, an ocean of monſters, for ſuch writers as Licetus to take their ſport therein.

Parée, familiar as he was with kings and princes, was not to obſerve the ſtrictest rules of decorum with ſuch antagoniſts as theſe. In the anſwer which he made to theſe heavy charges, we perceive, along with his ſharp reproof of Mr. Gourmelen, (mixed as it is with indelicacies, which the faſhion of the time gave countenance to), the natural good ſenſe, and the right education of Paræus, and the true grounds on which his character was founded, which he explains to us with a confidence and ſteadineſs well becoming ſuch a man †.

" You boaſt moreover, Mr. Gourmelen, that you will teach me my leſſons

* The Mare-Criſium is an imaginary ſea in the Moon, ſo named in all the Maps of that Planet.

† Davantage vous dites, que vous me monſtrerez ma leçon aux operations de chirurgie; il me ſemble que ne ſçuariez, parceque je ne l'ay pas appriſe ſeulement en mon eſtude; et pour avoir ouy par pluſieurs et diverſes années les leçons des docteurs en medecine: mes comme j'ay eſcrit cydevant en l'epiſtre au lecteur, j'ay fait reſidance en l'Hotel Dieu de Paris par l'eſpace de trois ans, ou j'ay eu moyen de voir et apprendre beaucoup d'œuvres de chirurgie, ſur une infinité de malades, enſemble l'anatomie ſur une grande quantité de corps morts, ainſi que ſouvent j'en ay fait preuve tres ſuffiſante publiquement aux eſcoles de medecine de Paris," &c.

in ſurgery, and my operations; but in that I believe, you are a little miſtaken; for my education has been quite after another faſhion. I have learned my art, not in my cloſet; no, nor by hearing the diſcourſes of phyſicians, (though that alſo, I have not deſpiſed); but in the Hotel Dieu, where I lived for three years, ſeeing many diſeaſes, and practiſing many operations upon the living body; and learning alſo much of the anatomy upon the dead; and this I truſt I have given ſufficient proofs of in the public ſchools."—"But I have yet more to boaſt of; for, being called into the ſervice of the kings of France, I have in my time ſerved four ſucceſſive kings, and I have followed them in battles, ſkirmiſhes, and aſſaults; ſometimes I have been in ſieges, and ſometimes blocked up with the beſieged, curing their wounds."—"And, laſt of all, I have lived in this great and famous city of Paris many long years, where, thank God, I have been held in ſome repute, and ranked, at leaſt, equal with my peers; inſomuch, that there have been few difficult, or famous cures, in which my head and hand have not been employed.—How! ſeeing theſe things, dare ſuch a man as you, who have made ſurgery no part of your ſtudy, talk of teaching me *?"

* It may not be amiſs to inſert the following quotation as a ſpecimen of the manner and language of thoſe times, and I am directed to this paſſage by a good mark, the Marginal Index; where I find the following ſharp taunt, entitled by Paræus, "Belle Similitude," p. 781.

"You remind me, Mr. Gourmaline, of a little ſcrubby boy, who had come from Lower Brittany to Paris forſooth to learn French;—and one day the organiſt of the great church of Notre Dame, found him lounging about one of the gates of the Palace, and took him to blow the organ. After three years, this little round fat-arſed fellow, (bien feſſu et materiel), ſenſible that he had learned not one word of French, returned to his father; telling him that now he could ſpeak good French, "and beſides, Vather, ſays he, I can play upon the organs." (et lui dit quil parla bonne Français et davantage qu'il ſcavoit bien jouer des orgues). The father, quite delighted with ſuch a ſon, goes ſtraightway to the organiſt of their great church, "Do, ſays the father, let my ſon try the organ; for I long to know whether he be ſuch a proficient as he ſays he is." The organiſt very obligingly went along with them, and the boy having got into the organ, preſently claps himſelf down by the bellows, with a ſort of inſtinctive jump. "Why what's this, ſays the organiſt with great ſimplicity?"—O nothing, ſays the boy, only you had beſt play upon the organ, for I play beſt upon the bellows." "Now I tell you, Mr. Gourmaline, that you have been all this while playing upon the bellows, while I have been playing upon the keys; it is a vaſtly eaſy matter, for a fellow like you, to heeze upon his chair and prattle about it; but performing ſurgical operations with the knife in hand, is quite another affair." P. 781.

"Partant, il eſt à croire, que n'avez jamais ſorty de voſtre eſtude, que pour enſeigner la theorique (ſi vous l'avez pû faire) les operations de chirurgie s'apprennent a l'œil et au toucher. Je diray que vous reſſemblez à un jeune garçon Bas Breton, bien feſſu et materiel, qui demanda congé a ſon père pour venir à Paris pour prendre France. Eſtant arrivé, l'organiſte de Notre Dame le trouva à la porte du palais, qui le

Yet Parée was touched with their reproaches; he allowed himſelf to be miſled ſo far by the doctrines peculiar to thoſe times, as to endeavour to prove that the principles of his invention, if not the actual practice of tying the blood veſſels, was to be found in the writings of the ancients; but, after long and diligent ſearching among the writings of Galen, Celſus, and Avicenna, he was unable to produce any authorities which could either ſupport his new practice, or injure his fame. It was a diſcovery which ſet him higher in ſurgery than Harvey is in medical ſcience, and it was altogether his own. Had this invention been well received, it muſt, in the courſe of two long centuries, have improved ſurgery very greatly, and ſaved innumerable lives. It would have rendered many operations practicable which the older ſurgeons never ventured upon; and have made thoſe operations ſafe which were not ſo till of late years.

Parée neglected nothing which could give effect to this important diſcovery. He tried to demonſtrate, that even the ancients would have approved of the practice. He alſo ſupported his reaſoning by facts; by his amputations, and other operations, and by his ſucceſſes in the moſt dangerous wounds. He gave the atteſtations of many eminent ſurgeons, and eſpecially of Gulliemeau, who then lived in the houſe with him as his pupil, and who, in the end, acquired a character worthy of his breeding. Nor can we obſerve, without ſurpriſe, how perfect Paree's operations were even in the infancy of this diſcovery.

Paree had three general ways of tying an artery; by paſſing the needle round the artery, down on one ſide and up on the other, and ſo tying in along with it a quantity of fleſh; or by drawing the arteries out from the wound, as from the face of a ſtump, by the artery forceps with a ſpring handle, which he called Valet a Patin; or by ſtriking the needle above the place of the wound, through the fleſh of the limb, down quite to the bone, ſo as to tie in the great artery of the limb, and along with it much of the fleſh.

print pour ſouffler aux orgues, ou il fut trois ans. Il vid qu'il parloit aucunement François, il s'en retourne vers ſon pere, et luy dit, qu'il parloit bonne France, et davantage, qu'il ſcavoit bien jouer des orgues. Le pere le receut bien joyeux dequoy il eſtoit en ſi peu de temps ſi ſçavant; il s'en alla vers l'organiſte de leur grande egliſe, et le pria de permettre à ſon fils de jouer des orgues, a fin de ſçavoir ſi ſon fils eſtoit bon maiſtre ainſi qu'il diſoit; ce que le maiſtre organiſte accorda volontiers. Eſtant entré aux orgues, il ſe jette de plein ſaute aux ſufflets, le maiſtre organiſte lui dit, qu'il jouait, et que luy ſouffleroit; alors ce bon maiſtre reſpond, qu'il jouait luy meſme des orgues s'il vouloit; car quand a luy il ne pouvoit jouer que des ſoufflets. Je croy auſſi; mon petit maiſtre, que vous ne ſçavez autre choſe que caqueter en une chaire; mais moi je joueray ſur le clavier et ferai reſonner les orgues; c'eſt a dire, que je ferai les operations de chi-

" If there be a bleeding artery, ſays Paræus, in any wound, dreſs the wound with aſtringents; but be careful at the ſame time to lay a firm compreſs over the wound, and ſettle it well with a bandage, and then lay out the wounded limb in an eaſy way."

" If this do not ſerve, clap your finger upon the point of the artery, and wait patiently till a clot be formed."

" If the artery continue to bleed, cut up the wound, (if it have been ſewed), and paſs a needle under the artery, encloſing along with it in the ligature much or little fleſh, according to the circumſtances of the caſe."

" If the artery have ſhrunk up among the fleſh, cut up the wound and tie the artery higher."

" But ſhould both ends of the artery have been ſtill further retracted, then continue your inciſion, and cut open the ſkin freely, ſtill purſuing the artery; but ſtill careful of the very artery that you are purſuing, leſt you ſhould cut it a ſecond time."

" In an amputated ſtump, draw your arteries out with the forceps, tie them neatly with a thread; but if once you miſs the artery, or your firſt thread give way, do not uſe the forceps any more; but paſs a needle four inches long into the ſtump, ſo as to tie in the artery, along with much of the fleſh."

" Theſe ligatures we are careful not to withdraw too early; nor muſt they ever be removed till the granulations of fleſh have grown up to protect and ſtrengthen the artery."

" If theſe operations fail, we muſt have recourſe to cauſtics, vitriols, or the actual cautery, which make eſchars and cruſts; and we muſt be careful to prevent theſe eſchars falling off till the fleſh be formed."

" Sometimes alſo the ſurgeon needs to cut the veſſel entirely acroſs, by which its ends, ſhrinking both ways among the fleſh, the flux ſtops: but always the ſureſt way is to tie the veſſel before cutting it thus acroſs *."

rurgie, ce que ne ſçauriez nullement faire pour n'avoir bougé de voſtre eſtude et des eſcholes, comme j'ay dit.

* " Puis par deſſus ſera mis une compreſſe, et ligature propre, et la partie ſera tenuë en bonne et deüe ſituation, et principalement ſans douleur, s'il eſt poſſible.—Et là où le ſang ne pourroit eſtre eſtanché par ces remedes, alors on oſtera la compreſſe, et preſſera-on du doigt ſur l'orifice du vaiſſeau, et y ſera tenu juſques à ce qu'il ſoit fait un thrombus, c'eſt à dire, que le ſang dedans, et autour l'orifice du vaiſſeau ſoit caillé, et par ainſi eſt engardé de ſortir.—Or, ſi la ſang ne laiſſoit de fluer, alors faudroit deſcoudre la playe (ſi on y avoit fait ſuture) et prendre le vaiſſeau par deſſus avec une aiguille vers ſa racine, avec bonne por-

This is a ſyſtem of inſtructions which is fairly extracted from Paræus's books, without mending the text, and though this ſyſtem be now one hundred and fifty years old, it is ſuch I believe as the beſt ſurgeon at this day in Europe could hardly improve. In correctneſs of practice, ſurgeons, from his time, went backwards for many ages. They were afraid to follow the bold ſurgery of Paræus; monſtrous fancies haunted their imaginations: Some had real fears, while others were pleaſed to find arguments of any kind againſt a practice ſo oppoſite to the ſcholaſtic doctrines which they had long cheriſhed; they were afraid, leſt the ligature ſhould give way, and they ſaid it would cut acroſs the artery! it would make the end of the artery mortify! it might be thrown off by the continual beating of the artery! ſo they ſtitched up the artery, croſs tied, and knoted it, and took all kinds of ſecurity. They not only tied one ligature round the artery, but they at the ſame time transfixed it with a needle, and then twiſted together the knots of both ligatures, and then, like children, afraid of what they had done, they feared leſt this firm tying of the artery might occaſion locked jaw, or univerſal convulſions; ſo that on their amputation table, was produced nothing ſmaller than tapes, and their needles, which were three or four inches long, were carried round each artery, at the diſtance of an inch, and ſometimes through the whole thickneſs of the limb. It is only after much experience, and by very ſlow degrees, that we have learnt at laſt, that the drawing out an artery, with the forceps or tenaculum, and the tying it fairly with a ſmall ligature, the method which appeared to the older ſurgeons to have every fault, is abſolutely the moſt ſecure.

tion de chair, ſelon que la partie le pourra permettre, et le lier: Car par ce moyen i'ay arreſté de grands flux de ſang, meſme aux amputations des membres, comme diray en ſon lieu.—Quelquesfois faut deſcouurir le cuir par deſſus, puis le lier, comme ſi la veine ou artere jugulaire avoient eſté coupées: ſi elle ſe retire tant en ſa partie ſuperieure qu'inferieure, il faut alors, pour la lier, eſleuer le cuir là l'endroit du vaiſſeau, et le couper ſans toucher audit vaiſſeau: puis eſtant deſcouvert, il convient paſſer une aiguille enfilée par deſſous, puis la lier: ce que j'ay fait pluſieurs fois.—Et devant que d'oſter le filet duquel on aura lié les veines ou arteres, faut que la chair ſoit engendrée deſſus, afin de boucher leurs orifices, de peur que le ſang ne deſcoulaſt derechef: parquoy ne ſe faut trop toſt avancer de tirer ledit filet, que premierement la chair ne ſoit regenerée.—Et là où le vaiſſeau en quelque partie que ce fuſt, ne pourroit eſtre lié, faudroit venir aux medicamens, eſchorotiques, faiſans crouſte, comme poudre de vitriol calciné, poudre de mercure avec autant d'alum calciné, ou cautere potentiel, leſquels font eſcarre: laquelle ne faut faire tomber, juſques à ce que nature l'aye fait choir d'elle meſme, et que l'ocher le ſang, le Chirurgien eſt contraint de couper du tout le vaiſſeau, pource qu'eſtant coupé, chaque portion ſe retire vers ſon coſté, et ſe cache dedans la chair, eſtant recouvert des parties circonceintes qui ſont deſſus, et lors avec peu d'ayde ledit flux

## OF COMPRESSION.

We muſt not wonder, that the ſurgeons of thoſe ignorant ages, ſchooled as they were by the phyſicians *, and under the dominion of a falſe learning, rejected this improvement; for the laſt ſtruggle againſt it was made by the moſt celebrated ſurgeon of modern Europe, Mr. Petit.

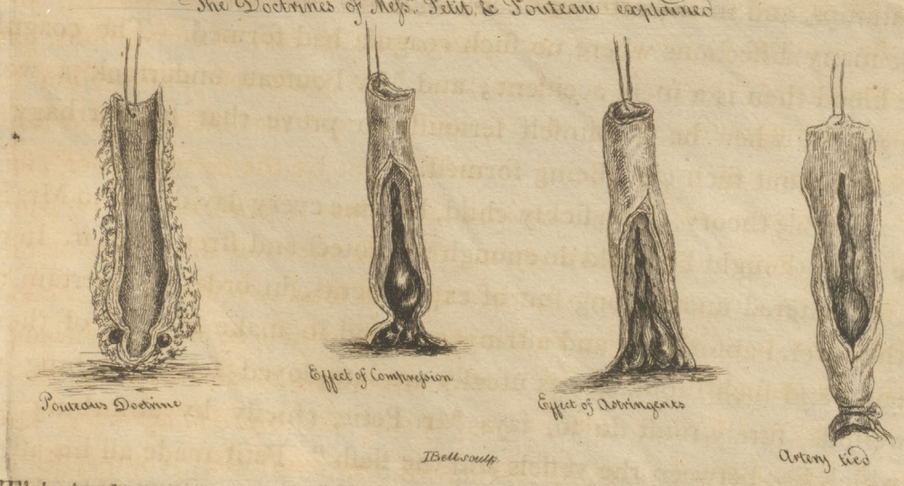
You muſt obſerve, that neither ſtyptics, nor cautery, nor vitriol buttons, nor agaric, nor any other means of ſuppreſſing hæmorrhagy, ever was uſed alone. The agaric and vitriol buttons were always reinforced by compreſs and bandage; the eſchars of cauteries were ſupported by thoſe graduated compreſſes; nor did the ſurgeon ever truſt entirely to the ligature itſelf, but ſupported the veſſels with compreſſes and bandage, even when the needle was uſed; often he crammed a wound with aſtringent powders and hare's fur, ſupported theſe firſt dreſſings with a compreſs, and kept the tourniquet ſkrewed with a dangerous and painful degree of firmneſs round the limb. The great abilities of Mr. Petit, the period at which he lived, (when ſurgery began to be a free branch of ſcience); the irregularity of the practice in regard to wounded arteries; and, above all, the averſion to the uſe of the needle, and the fear of convulſions, gave to his ſpeculations very particular importance. He preferred compreſſion to all other means of ſuppreſſing hæmorrhagy, and believed that bleeding was ſtopped, not by the obliteration or retraction of veſſels, but by the formation of clots.

Mr. Petit believed, that every bleeding artery was ſtopped merely by the coagulum which formed in the mouth of it: that all means of arreſting hæmorrhagy were uſeful only in proportion as they formed ſolid coagula: that the coagulum varied in its ſhape according to the means by which it was produced; and the ſecurity he thought more or leſs perfect, according to the ſhape of the coagulum. Aſtringents formed clots by coagulating the blood! Sponges, boviſta, and ſcraped lint, formed clots by abſorbing the moiſture! compreſſes made firmer clots, by ſhutting, and ſometimes doubling down the mouths of the arte-

eſt eſtanche.—Mais devant que le couper, ſi on le peut lier, comme avons dit cy-deſſus, ſera encores plus ſeur.

* Even ſo lately as the year 1738, Hoffman, in his Medicus Politicus five regulæ prudentiæ, ſays, Medicus nimiam familiaritatem cum Chirurgo non ineat—in cura Herniarum ne caſtrentur viri impediat Medicus.—Examinat Inſtrumenta Chirurgica, viſitat emplaſtra unguenta, &c.

ries, allowing time for the firm coagulation of the blood! Even the tying of arteries he thought more ſecure, in conſequence of the peculiar form of the clot formed within the artery; and when (as ſometimes happens) there was a ſlight bleeding upon pulling away the ligature, he aſcribed that to the conical form of the clot, and to the blood gliding by the ſide of it; when there was a more dangerous bleeding upon pulling away the ligature, he imagined it to proceed from the clot ſlipping forwards in the artery, and being at laſt entirely expelled from it. In a tied artery, ſays Petit, we obſerve the clot to be of a conical form! In an artery, which has been ſtopped by compreſſion, we find the mouth of the artery quite flattened, and the clot of the ſhape of the reed of a hautboy; but in arteries ſtopped by lint, or aſtringents, we have a clot formed, partly by the contraction of the mouth of the artery, partly by the effect of the dreſſings, in which caſe the clot is formed half without the artery, and half within; the flattened part of the clot within the artery ſerving as a ſort of plug, while the part that is without lies over the mouth of the artery like a cap or cover, and this part is ſo connected with the clot within, and at the ſame time ſo adheres to the dreſſings without, that the rude or early removal of the dreſſings pulls it away.




This is the whole of Petit's doctrine, which is triflingly ingenious, dangerous in practice, unworthy in all reſpects of ſo great a man; yet ſuch hold had it got upon his mind, that he wrote upon it as if his fame had been to reſt upon this diſcovery alone; and for the ſake of this doctrine he publiſhed the moſt daring facts, and perſevered in the moſt dangerous practices. The Royal Societies of England and France were the organs by which the learned of thoſe days

were connected with the public, and formed a natural connection betwixt the two countries. The philoſophers, but particularly the phyſicians, of both countries, were impatient to have their trifling papers introduced into theſe journals. Mr. Petit having ſet himſelf to diſſect for clots in aneuriſms, and in thoſe who died after amputation, eaſily found proofs ſufficient for his purpoſe; among the chief of which was a larger and ſolid clot, about three inches long, which he found in the femoral artery of a man who died on the 5th day after amputation of the thigh, which artery was preſented to the Royal Academy of Sciences in great pomp. Perhaps it would be eaſy to ſhow that the great Academy of the great monarch, Louis Quatorze, was eaſily ſatisfied, in preſents of this nature; but why ſhould we contradict the fact, ſince the proving that ſuch clots exiſt, does not eſtabliſh this dangerous doctrine; the artery is not cloſed by the clot of blood, but the clot of blood is formed in conſequence of the cloſing of the artery. How, indeed, can we ſuppoſe any artery to be cloſed by a ligature without the blood ſtagnating behind it? or the arteries of a gangrenous limb to lie quieſcent and inactive for days without the blood coagulating in them? White and Hunter have found coagula of blood in aneuriſms, in the arteries of amputated ſtumps, and in the arteries of a gangrened limb! but we have, on the other hand, many diſſections where no ſuch coagula had formed. The coagulation of the blood then is a mere accident; and Mr. Pouteau undertook a work of ſupererogation, when he ſet himſelf ſeriouſly to prove that hæmorrhagy is often ſtopped without ſuch clots being formed.

Yet this miſerable theory, like a ſickly child, became every day dearer to Mr. Petit; and he never thought he could do enough to protect and ſtrengthen it. In the year 1732, he entered upon a long ſuit of experiments, in order to aſcertain the power of the ſeveral abſorbents and aſtringents, and to make a ſcale of them: "Aſtringents, and ſuch ſubſtances as uſually are employed for ſtaunching the blood of wounds, ſurely muſt do ſo, ſays Mr. Petit, chiefly by abſorbing that humidity which lies between the veſſels and the fleſh." Petit made all his aſtringent abſorbents, that they might drink up the thinner parts of the blood, and ſo help to form for him good, ſtiff, ſolid clots. He put lumps of mutton into tea-cups, with a reaſonable proportion of the following aſtringents; firſt of Common Bole, then of Terra Sigillata, which is a finer earth or bole, then of Paris plaſter, then of ſlacked lime, then of various aſtringent gums, then of Gum Arabic, then of Vitriol, then of Salt, then of Sugar; and, laſt of all, of Cob-

webs; and obſerved, with moſt curious preciſion, the exact degree in which each of theſe fooliſh things contracted, or hardened the lumps of mutton; which experiments are ſtill extant in excellent French, in the Acts of the Academy of Sciences for the year 1732; a perfect burleſque upon ſuch experiments, and ſuch ſubjects: Towards the end of this moſt philoſophical paper, Mr. Petit inſerts this wiſe caution, which completes the joke: "But all theſe aſtringents muſt of courſe abſorb more humidity, and act in a more lively and perfect manner in the living body, whoſe parts are always warm, and always ready to put themſelves in motion by the force of the animal ſpirits, which are continually flowing *." There is not even in the Annals of our Royal Society, any thing to be compared with this. There were, indeed, ſome experiments made in this country upon aſtringents, of pretty nearly the ſame rank with thoſe of Mr. Petit; I mean the experiments of Mr. Young of Plymouth, publiſhed in his far-famed book the CURRUS TRIUMPHALIS, ex TEREBINTHINO, a eulogium on the virtues of boiling turpentine as an aſtringent. He obſerved, that turpentine, ſpread upon a deal board, became quickly dry: that painters uſed it in mixing their colours, to make them dry ſuddenly; and he found, upon dipping his finger firſt into reeking blood, and then into hot oil of turpentine, that it begat a ſenſible ſtraitneſs," &c †.

But I ſhould want all apology for this long account of Petit, and of his doctrine, if it were not that it is a dangerous doctrine, and had abſolutely led Petit himſelf into great miſtakes; he perſuaded himſelf that the ligature was hardly more ſecure than any common means of ſuppreſſing bleeding; that it was only in ſo far uſeful, as it enſured a firm and conical clot; that if the ligature fell off before this clot was fully formed, and perfect in its office, the artery would bleed. He therefore preferred the uſe of a compreſs, to that of a ligature, even in ſecuring the arteries of a great ſtump: And we find him boaſting, that though this method, viz. of compreſſion, is the oldeſt of all, he will give to it all the effects of novelty; "and ſince compreſſion is the moſt natural way, and the very means which ſhould have preſented itſelf, firſt of all, to the imagina-

* "Tous ces aſtringents doivent abſorber plus d'humidité, et agir plus efficacement, ſur les parties d'un corps vivant, qui ſont chaudes, et toujours pretes a ſe mettre en contraction par les eſprits animaux qui y coulent inceſſamment."

† Whence he concludes, "that it reſtrains an hæmorrhage by contracting the orifice, and begetting a firm coagulation of the blood; which coagulum, &c. page 46.

tion of the ſurgeon, I will reſtore it, ſays Petit, and ſet it up above all other means; as cauteries, aſtringents, ſponges, or even the ligature." There is not one of all theſe, ſays Petit, that is ſufficient of itſelf; we muſt uſe the compreſs to aſſiſt even the ligature.

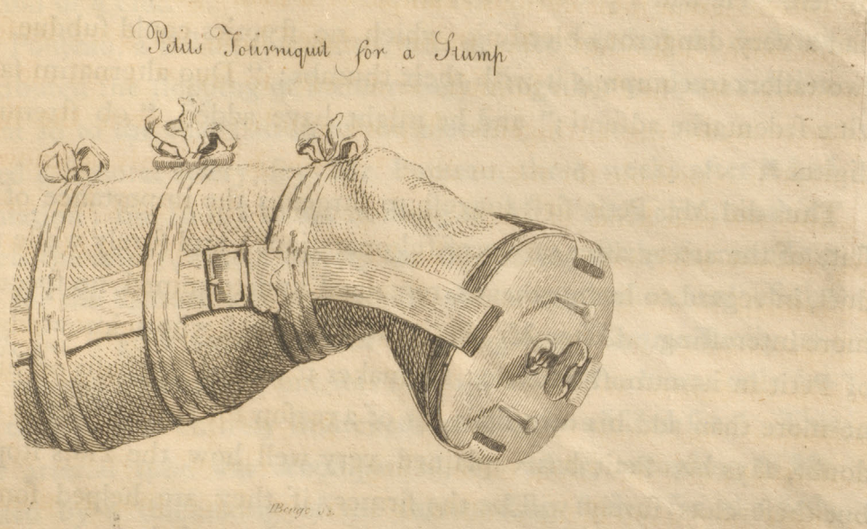
We have here a moſt curious example of a man's genius and his good ſenſe at variance with each other. His theory ſeduced him, his good ſenſe would have kept him right; he forces himſelf, as it were, to ſay, " I will uſe the compreſs in preference to the aſtringents, ſtyptics, cauſtics, or even the ligature itſelf; wherever it is poſſible for me to do ſo * :" which is plainly acknowledging, that he would uſe that kind of uncertain operation, to which his theory inclined him, wherever he was not forced by the immediate danger of the caſe, to betake himſelf to ſome ſurer means of reſtraining the blood.

Experiments, of the philoſophical and ſpeculative kind, we can endure; but experiments on the human body are not ſo eaſily vindicated. Mr. Petit maintained, not only theoretically but practically, that compreſſion was the ſureſt means of ſuppreſſing hæmorrhagy. " The art, ſays he, of ſtopping hæmorrhagy by compreſſion, conſiſts leſs in the force that is uſed than in the ſteadineſs with which it is applied. The ſlight preſſure of the finger alone is ſufficient, if but the ſtump and the finger could be kept ſteady; nor is any thing required to make compreſſion perfectly ſucceſsful, but to invent a machine which ſhall perform the office of ſuch a finger. Such a machine did Mr. Petit invent. It was a complicated tourniquet, conſiſting of one circular, which compreſſed the artery in the groin, and of two parallel plates of iron, which were moved by a central ſcrew, and compreſſed the flat face of the ſtump †. To vindicate this ſtrange invention, he delivers a caſe of an oſſified femoral artery,

* " La compreſſion a dû être le premier moyen qui s'eſt préſenté naturellement à l'eſprit des hommes, pour arrêter l'hémoragie; c'eſt auſſi celui qui eſt le plus efficace; et quoiqu'il ſoit le plus ancien, je me flatte de lui donner aujourd'hui tous les avantages de la nouveauté, ſoit par rapport à la maniere de comprimer les vaiſſeaux, ſoit par rapport à l'uſage excluſif que je lui donne, en rejettant celui des aſtringens, des ſtiptiques, des cauſtiques, et de la ligature même, *autant qu'il eſt poſſible*. Je commence par quelques obſervations ſur la maniere dont la nature concourt avec l'art pour arrêter le ſang."

† It was perhaps the only wrong thing Petit ever did, and he has not been ſpared. Mr. Gooch, and Mr. B. Bell, the *alter ipſe* of Gooch, have perſecuted him with ſuch praiſe as they could beſtow. Petit's ſpirit has fully expiated this one fault; nothing can be more degrading than injudicious praiſe; nothing can be more dangerous to a man's poſthumous fame, than to have thoſe things commended and recorded which ſhould in mercy be forgotten.

which, after amputation of the thigh, ſtood out with open mouth, and was not affected even in the ſlighteſt degree by the firmeſt drawing of the ligature.—Strange caſe! ſince nothing of the kind had been ever heard of before; nor has any thing like it occurred ſince, though amputation is our daily work.




Thus we perceive to what extremities Petit was driven to ſupport his doctrine, and his averſion from the needle, and his perſeverence in uſing compreſſion, is ſtrongly marked by the following fact: "A nobleman of the firſt rank in France, and in whoſe fate the whole kingdom took an intereſt, having been wounded in the thigh bone with a muſket-ball, lingered, in a very miſerable condition, for nineteen years: at the end of which time the ſurgeon diſcovered, and extracted, by inciſions, ſome fragments of bone and ſome pieces of iron, (eſpecially the ball of a ſcrutoire key), and along with them ſome rags of his breeches; but, his ſtrength being quite exhauſted, they were forced to amputate his thigh.

This gentleman, ſome days after the operation, very imprudently raiſing himſelf ſuddenly in bed, without help, the femoral artery burſt out; and ſuch was the averſion of Petit from uſing the needle a ſecond time, or the cautery, or vitriol button, or any thing but his favourite compreſſion, that he appointed four young ſurgeons to watch with him, two and two, night and day, preſſing upon the face of the ſtump.

Compreſſion was much practiſed in thoſe days; the authority of Petit revived it juſt at the time that ſurgeons began to be familiar with the needle, and to loſe

their apprehenſions of ſpaſms and convulſions. To have young ſurgeons and aſſiſtants ſitting upon the ſide of the bed for days, keeping in the blood, was no unuſual thing. All ſurgeons practiſed this method, but none of the old ſurgeons perhaps ever fell upon ſo ingenious and good humoured a device as Ruinhuiſen. He had a patient who, from a venereal ulcer on the back of the glans, had a very dangerous bleeding, which no ſtyptics could ſubdue. He ſet down two tailors to compreſs it with their thumbs: "Duo alternatim ſartores tanquam vitæ ſedentariæ adſueti;" and he might have added, "ob ſtrenuos indomabiles digitos *.

Thus did Mr. Petit firſt ſuggeſt to ſurgeons the importance of examining the ſtate of the artery after unſucceſsful operations; and ſurely while the line of conduct, in regard to hæmorrhages, remained undetermined, no ſpeculation could be more intereſting. After Mr. Petit came Morand, who acknowledged the doctrine of Petit in its utmoſt latitude: he makes it indeed the baſis of his own: he does no more than add his own little bit of a reaſon for the formation of clots. "No doubt, ſays he, Petit has explained very well how the clots ſtop hæmorrhagy; but theſe clots ſurely will be the firmer, if they are helped ſomewhat by contraction of the artery." His idea of the ſtate of the artery, which aſſiſted in forming, or in ſupporting the clot, was miſerably confuſed; it was neither that contraction of diameter in the artery which Kirkland, White, and other Engliſh ſurgeons, have ſuppoſed; nor that retraction of the artery among the ſurrounding fleſh which has been ſo much inſiſted upon by Pouteau and other reſpectable writers, but an equivocal generation betwixt thoſe two ideas floated in Mr. Morand's brain. Through the whole of his laborious paper he expreſſes his confuſed idea by the word "criſping up of the artery," par la criſpation du tuyau; and he

* This was no uncommon thing, and was a ſtrong proof how imperfect all theſe methods of ſuppreſſing hæmorrhagy were. Mr. Turner ſays, "And here I can aſſure you, that in a deſperate hæmorrhage of the like kind, I have had this poſt myſelf for ſix hours ſucceſſively, retaining an emplaſtic, ſhifting my fingers as they were cramped, and taking my repaſt at the patient's bed-ſide, not ſuffering a drop of blood to be loſt for that time, although a cough attending gave us fearful apprehenſions, as well as an unruly patient we had to increaſe them. Upon removing my finger, the dreſſings being dry, and ſticking cloſe, I gave a charge to two others, hired to ſit up all night, and take their turns, how to perform the ſame taſk; but whether through remiſſneſs or inadvertency, upon a violent fit of coughing, beyond the reach of a full doſe of an opiate I had given him, before I took my leave, to alleviate the ſame; notwithſtanding their endeavours, who, in the ſurpriſe I ſuppoſe, miſtook the place of compreſſion, the artery burſt out afreſh, and the patient living out of town, was exhauſted before I or any other help could come to aſſiſt him."

can tell no more of the proceſs than that this cabbaging of the artery aſſiſts the clot. In ſhort, he ſubſcribed to the doctrine of Mr. Petit, but could not refrain from adding ſomething of his own; and I believe I have done juſtice to the idea of Mr. Morand, in ſuppoſing that he imagined a curling back of the mouth of the artery, a ſort of intus-ſuſceptio, ſuch a ſtraightening of the tube, as was favourable to the formation of a clot.

Next came Mr. Pouteau, a bolder ſpeculator, who at once rejected the doctrine of Petit, and attributed the ſtopping of hæmorrhagy altogether to the condition of the artery, not at all to the coagulation of the blood.

" I have diſſected a femoral artery, ſays Mr. Pouteau, three weeks after it had been tied in amputation; but in it I found nothing of Mr. Petit's clot; nothing to cloſe or compreſs the artery, except merely the thickening of the ſurrounding cellular ſubſtance, for the ligature was looſe about the artery! the canal of the artery was conical, for it grew narrow nearer to the ligature! Immediately under the ligature it was not obliterated, but was much ſtraitened: It was only below the ligature that it was entirely ſtraitened, ending in a blind ſac." This ſtraitening of the arterial tube was accompanied, or rather, according to Mr. Pouteau, was cauſed by a thickening of the ſurrounding fleſh; for the fleſh, he obſerved, which ſurrounded the ſtraitened part of the artery was a good deal gorged and ſwelled, that which lay immediately under the ligature was in a ſtate of gangrene; the fleſh again which adhered about the mouth of the artery, where it ended in the blind ſac, was of a cartilaginous hardneſs, and much ſwelled. It was Mr. Pouteau's opinion, that the ſwelling of the ſurrounding cellular ſubſtance compreſſed the artery, and ſtopped the blood.

This, then, being the doctrine of Mr. Pouteau, his practice follows his doctrine reaſonably well; for, ſays Mr. Pouteau, " let it be once proved that it is the ſwelling merely of the parts ſurrounding the artery that prevents the blood flowing out, and it follows of courſe, that the greater the bundle of fleſh that is accumulated round the artery, the more of the parts you include in your ligature, the greater the ſwelling muſt be, and the reſiſtance to the eruption of the blood muſt be proportionably great *.

The doctrine of Mr. Pouteau ſeemed to be, at leaſt, harmleſs: It ſeemed in-

* " Mais s'il eſt une fois avéré que le gonflement des parties au deſſons de la ligature, fait le principal obſtacle a l'irruption du ſang arterial, il ſera naturel de conclure, que plus ce gonflement ſera conſiderable, et plus il oppoſera de reſiſtance a l'impetuoſité du ſang arterial.

deed to inculcate the ſafeſt practice of all, viz. that of tying arteries with the needle firmly. But here we ſee the villany of falſe doctrines, which lead us unawares into ſuch practices, as, in our cooler moments, we cannot but remember with regret. This doctrine requires that the operator ſhould tie in all the ſurrounding parts; and Mr. Pouteau made no ſcruple, under this ample title of all the parts, to comprehend the great nerves alſo. He regarded the tying in of the nerve as a ſecurity to the artery, or rather I fear he conſidered this cruelty as a ſecurity to his doctrine. He proceeds to repreſent the tying in of the great Radial Nerve in aneuriſm of the arm as nearly harmleſs, and the tying in the nerves, along with the arteries of an amputated limb, as quite ſo. Thus an opinion, which the world imagines to be the pure reſult of experience, and receives as an independent and abſolute fact, is a mere appendage to a trivial doctrine! and this affirmation that it is ſafe to tie in nerves, although it comes from a practical ſurgeon, deſerves no more notice than if it had come from a Spallanzani, or Fontana: yet has it been implicitly received, the doctrine has made already an alarming progreſs; at firſt ſurgeons were apprehenſive of nothing ſo much as ſpaſms and convulſions, from the tying or injuring of nerves; but now, in the other extremity, they are come to ſport with their patients feelings; and Kirkland, a ſurgeon juſtly celebrated for his good ſenſe and conſcientious attention to the practice and improvement of his profeſſion, ſays, in one part, "May not the pain, upon tying a nerve, as it is ſmart and of ſhort duration only, ſomewhat in the manner of volatiles applied to the noſe, rather enliven the ſpirits than bring on convulſions *." This is enough to cure any ſenſible man of any inclination he may have indulged, for thoſe who blend theory and facts in this ſtrange faſhion, who compare the ſmart pain, or rather as I would term it, the ſhock and terrible violence of tying a nerve with ſo ſlight a matter, as the ſnuffing hartſhorn up the noſe. Let any man who will talk to me on this point, firſt demonſtrate that the tying in of nerves will do good, before I cloſe with him upon the ſecondary queſtion, whether it may not do harm.

Allow me here to obſerve two things: I, in the firſt place, diſapprove of tying in the nerve! it is not the convulſions I fear, nor the pain of tying in the nerves, conſidering the nerves but as dead parts, theſe conſequences will never fail to enſue; the nerves are peculiarly firm and unyielding in their nature, they undergo their changes very ſlowly, they do not fade under the ligature as the artery does,

* Kirkland, p. 22.

Drawing of Nerves imprudently tied in along with the Femoral Artery in Amputation ——— p. 177

a The Femoral Artery
b The Profunda
c the Inguinal Glands
d Anterior Crural Nerve
f the Clot of Blood above the Ligature

ee The two chief Branches of the Anterior Crural Nerve tied in along with the Femoral Artery & the Profunda

J. Bell del.

nor yield when we would pull the ligature away; the ligature keeps its hold upon the nerve, remains firm, and, acting as a foreign body, prevents the adheſion of the ſurfaces of the ſtump, or of any ſmaller wound: the irritation often produces Eryſipilatous inflammations, and in the end we are obliged to pull ſuch ligature away, or cut it off from the nerve, not without violence and danger. I have ſeen ill conſequences ariſe from the tying in of nerves in aneuriſm, both of the thigh and of the arm, which at preſent I would not chooſe to explain: Indeed in this very diſſection of the femoral artery by Mr. Pouteau, we find that three weeks after amputation the ligature ſtuck firm in the ſtump, which could not have happened otherwiſe than from his imprudent practice of tying in, along with the great artery, much of the ſurrounding fleſh, and the anterior crural nerve; and thus his doctrine alſo leads to incorrect and dangerous practice.

Secondly, I would obſerve that Mr. Pouteau has contrived to ſupport his doctrine, by explaining only half the truth: He has not given a fair repreſentation of the condition of a tied artery: He repreſents to us a great arterial trunk tied coarſely with the needle, with much fleſh and cellular ſubſtance tied in along with the artery, and ſo takes the opportunity of inſinuating his doctrine, by ſaying, "There was in this diſſection much cellular ſubſtance thickened above the ligature, and there was a like thickening of the cellular ſubſtance below; the mouth of the artery was cloſed, but that part of the canal, which lay immediately under the ligature, was not obliterated." In the preſent day we uſe the tenaculum; the artery is drawn far out from the ſurrounding fleſh; we tie the artery alone, and the nerve is not included; there is no cellular ſubſtance round the artery to ſwell and cloſe the mouth of it.

Amidſt this confuſion of opinions there was engendered here in England a new doctrine of the CONTRACTION of ARTERIES; and you will obſerve, that there is a diſtinct connection among all theſe theories, and a very natural progreſſion of ideas, from the criſping of the artery, which Mr. Morand ſuppoſed to that contraction of the artery which has been obſerved by the Engliſh ſurgeons; a doctrine which they have been at infinite pains to eſtabliſh, but which carries nothing with it impoſing, except the names of White, Kirkland, and Dr. Aitken, who were the chief ſupporters of it. If theſe gentlemen had affirmed that the retraction of arteries among the cellular ſubſtance was the accident which prevented great loſs of blood, the theory might have led to very intereſting concluſions; but their theory was quite different. They imagined, that when the

artery was cut, its mouth gradually contracted, its diameter being abridged, and the ſtream of blood diminiſhing every moment, till it entirely ſtopped by the mere contraction of the artery. Their doctrine went ſtill farther; they aſcribed even the obliteration of the higher parts of the artery, (i. e. from its mouth up to the next branch), to this contraction of its coats.—"I am now convinced, ſays Mr. White, in oppoſition to the doctrine of Pouteau, which once ſeemed more probable, that according to the ſuppoſition of Mr. Gooch, ſince confirmed by my ingenious friend Mr. Kirkland, the arteries, by their NATURAL CONTRACTION, coaleſce as far as their firſt ramifications *:" And Mr. Kirkland ſays, "that nature ſuppreſſes the hæmorrhages from divided arteries, by the natural contraction of their muſcular fibres †:" And Mr. Aitken of Warrington adds, "that the obliteration of the ſac, in the extremity of the artery, is cauſed by its NATURAL CONTRACTION ‡." We have but too much reaſon to be jealous of any doctrine which might beget an indifference to the ſecuring of arteries by ligature; and ſhould we revive this doctrine of the contraction of arteries, then we ſhould be inclined to wait for their retraction, and ſhould conclude with Petit, that a compreſs, or the ſlighteſt aſtringent, were better and ſafer than the needle. Thoſe ſpeculators did indeed draw this bold concluſion from their theory. "In all ſmaller arteries, it is, ſay they, ſufficient juſt to clap the point of a finger upon the artery, and wait till it has ſhrunk."

This doctrine, then, is as dangerous as that of Mr. Petit! when a hæmorrhagy is interrupted only by clots, or when a hæmorrhagy has relented from the mere contraction of the artery, the patient is never free from danger, nor the ſurgeon from alarm. Doctrines like theſe will never ſerve as a baſis for ſenſible rules of practice; and I think it therefore important, in this place, to explain to you my own opinion of this matter; for whether an artery be tied, or have ſtopped ſpontaneouſly, it is in a condition very different from what has

* Page 171.

† Page 10.

‡ Vide Mr. Aitken's Pamphlet, page 193. Theſe gentlemen have been at great pains to eſtabliſh their doctrine of the contraction of an artery on principles and facts. The only facts, are the docking of horſe tails, and the cutting off their legs. Theſe are to be found in Mr. Kirkland's Treatiſe; and the only principle, that is to ſay, the only general fact, which I have ever yet been able to diſcover, is, that an artery cloſes, not only immediately under the ligature, but for a conſiderable way above, that is, up to the neareſt inoſculating branch. The cloſing under the ligature is plainly the work of the ligature; the obliteration of the canal, higher than the ligature, is ſuppoſed to ariſe from this CONTRACTION of the artery.

been hitherto deſcribed; and many of the precautions I ſhall afterwards recommend to you muſt have a very direct relation to the condition of the artery, which neither is cloſed by the contraction of its circular fibres, nor obliterated by the preſſure of the cellular ſubſtance.

Let us then conſider the following points of doctrine, with the practical inferences that are to be drawn from them: Firſt, The natural cauſes by which a hæmorrhagy is ſtopped; and, ſecondly, The condition of an artery when tied with a ligature.

## OF THE NATURAL CAUSES BY WHICH A HÆMORRHAGY IS STOPPED.

When an artery has been tied ſecurely, we are, from that moment, free from all uneaſineſs; but when it ſtops merely by preſſure, by aſtringents, by the formation of clots, by the contraction of the artery itſelf, whenever hæmorrhagy ſtops from any natural cauſe! it is apt to return; and we inquire anxiouſly into thoſe natural cauſes for this reaſon; that hæmorrhagy is at the firſt eaſily ſtopped; it ceaſes even from the faintneſs of the patient, if not by the interpoſition of the ſurgeon; but it is this accident of ſecondary hæmorrhagy that chiefly alarms us.

When hæmorrhagy ſtops of its own accord, it is neither from the retraction of an artery, nor the conſtriction of its fibres, nor the formation of clots, but by the cellular ſubſtance which ſurrounds the artery being injected with blood; and to be aſſured of this, we have but to obſerve, what happens in arteries of various ſizes. Firſt, Let us ſuppoſe the wounded artery to be ſo ſmall as juſt to ſpurt out its blood; the ſtream of blood gradually leſſens, becauſe the artery is emptied, and the reſiſtance to the arterial action taken away; the ſtimulus being gradually leſſened, the artery every moment acts leſs powerfully; and the blood being no longer ſolicited or urged on by the arterial contractions, forſakes the open artery, and moves along the neighbouring branches. The ſurgeon claps the point of his finger upon the mouth of the artery, and holds it there; the outward bleeding is prevented; the blood is extravaſated into the cellular ſubſtance round the mouth of the artery; the cellular ſubſtance is ſlightly injected with blood;

that blood coagulates; and that ſlight barrier is ſufficient to reſtrain the bleeding of a ſmall artery, till the parts inflame, and the artery is entirely ſtopped.

Secondly, Suppoſing the artery ſtill larger and more powerful, and that it drives its blood very furiouſly among the cellular ſubſtance, it is not this ſlight injection of the cellular ſubſtance that will reſtrain the bleeding! whenever the finger is removed, the blood burſts through this ſlight impediment! The injected cellular ſubſtance will not ſupport the artery, unleſs the cellular ſubſtance itſelf alſo be ſupported. Suppoſe then that the ſurgeon firſt claps his thumb firmly upon the artery, and then thruſts down a piece of ſponge cloſe to the wounded artery, applies over that a compreſs, and bandages over all to ſupport the ſponge and compreſs in their place; the artery ſtill bleeds (though in a reſtrained way) both into the cellular ſubſtance beneath the ſponge, and into the ſponge itſelf, till at laſt the blood coagulating in the ſponge, and in the cellular ſubſtance, they become as one maſs, and often the ſponge keeps its place till the parts inflame and ſuppurate, when, of courſe, the wounded artery heals along with the other parts.

Thirdly, But often it happens that the blood, which was at firſt firmly coagulated, begins to loſe its conſiſtence; or that by ſome unwary motion, or by a febrile excitement, the artery acts violently; more of the cellular ſubſtance is filled with blood, and the firſt firm coagalum and the ſponge being removed from the mouth of the artery, the ſofter cellular ſubſtance behind them is filled with fluid blood, and the artery, forcing that ſlighter obſtacle, burſts out again.

Fourthly, Suppoſing the ſurgeon to be bold, but not dexterous, and that, in place of uſing the ſponge, he makes a dive with the needle at that part which he obſerves the bleeding to come from! He never ſees the proper mouth of the artery; the injected cellular ſubſtance conceals it from him; he thinks he has tied the artery, when, in truth, he has tied only the cellular ſubſtance over the mouth of it; the bleeding is ſuppreſſed for a moment; the cellular ſubſtance, betwixt the mouth of the artery and the ligature, is filled with blood; that blood coagulates; the ligature ſerves but as a compreſs, till ſome accident fills more of the cellular ſubſtance; the mouth of the artery is farther removed from the ligature; the cellular ſubſtance dilates, in conſequence of the artery injecting it with fluid blood, till at laſt it gives way, and the hæmorrhagy burſts out anew. Thus we perceive, that retraction of the artery has no effect in ſuppreſſing hæmorrhagy, but as it fills the cellular ſubſtance; and that this injection of the cellular ſubſtance is but a ſlight obſtacle, fit to ſupport only the

very ſmalleſt arteries. The natural powers which reſtrain hæmorrhagy do but ſuppreſs it for a time, and expoſe the patient to ſecondary hæmorrhages; and ſponges and ſtyptics are hardly to be truſted any more than the mere retraction of the artery. The hæmorrhagy is ſeldom reſtrained by ſuch means, long enough to allow of the inflammation of the parts, or the obliteration of the wounded artery.

The condition of the wriſt, or any other naked part, and eſpecially the ſudden ſwelling, and the frequent eruptions of blood, after a wound in the artery, are not to be explained by any doctrine than this; and I am well contented to take a wound of the Radial Artery as a proof and example of this theory; for the accident is peculiarly frequent. The radial artery is one of that order and ſize which cannot be reſtrained but by the ligature. The ſuperficial ſituation of this artery, the nakedneſs of the bone on which it lies, the great ſwelling of thoſe naked and tendinous parts a few hours after the artery is wounded, the difficulty of finding the artery, and the cruelty of the operations which have been performed, make the caſe important both as a common piece of ſurgery, and as a general example of this kind of wound.

The Radial Artery, at the place where we feel the pulſe, lies quite ſuperficial. We even ſee the beating of the artery through the ſkin, and when we diſſect the wriſt, or look to a preparation, we ſee nothing but the artery betwixt the ſkin and the bone; yet when this part is wounded, we ſeek in vain for this ſuperficial artery; we ſearch for it by cutting through a moſt unexpected thickneſs of parts; this artery, which was felt ſo readily with the finger in its natural condition, we cannot now feel beating, even though the ſkin be open and the wound deep. We obſerve the beſt ſurgeons at a loſs to find the artery; we find them thruſting down ſponges, leaving tourniquets half ſcrewed about the arm for many weeks; making unſucceſsful inciſions, diving in vain with the needle, and at laſt ſtriking the needle through the whole thickneſs of the arm, ſo as to intercept the artery with a coarſe ligature at the diſtance of three inches above the wound *. Theſe difficulties never can be explained by attending only to the anatomy of the natural parts; here the diſeaſed and the ſound ſtate of the parts muſt be deſcribed together, and anatomy and ſurgery muſt go cloſely hand in hand.

* Mr. O'Halleran.

The artery of the wriſt lies not immediately under the ſkin, but under a thick faſcia, which, in its natural ſtate, attracts but little notice. The general faſcia of the fore arm, ſtrengthened remarkably at the two condyles of the ſhoulder bone, and farther reinforced by the tendinous expanſion of the biceps muſcle; deſcends very ſtrong along the fore arm, encloſing all the fleſh; the facia is very thick at the wriſt, where, though it is a firm and continuous web of tendon, its gliſtening fibres are diſtinguiſhed running acroſs the arm, and binding down the flexor tendons. Under this faſcia the radial artery lies: this faſcia is connected with the tendons below by a looſe and gliding cellular ſubſtance; and it is moreover to be remembered, that all through the body each artery has its own peculiar ſheath of cellular ſubſtance! even the ſmalleſt muſcular arteries have ſuch a ſheath. This faſcia, which is itſelf but a firmer cellular ſubſtance, is ſurrounded with a looſer tiſſue of cellular membrane, both on that ſurface which lies upon the muſcles, and on that which is connected with the ſkin.

No ſooner is the radial artery wounded than the awkward attempts of the aſſiſtants prevent the blood burſting out freely; the cellular ſubſtance of the ſkin is injected with blood; and the ſkin, long before inflammation could come on, is inflated, as it were, to a great thickneſs. The artery ſhrinks under its faſcia; the cellular ſubſtance of the faſcia is injected with blood; it riſes over the mouth of the wounded artery; it is injected not like the looſer cellular ſubſtance of the ſkin! This firmer cellular ſubſtance of the faſcia is ſo crammed with blood, and that blood is ſo firmly coagulated, that the parts are as it were baked together, and the hæmorrhagy is rather an oozing of blood from a ſubſtance reſembling the Corpus Cavernoſum Penis. The whole bottom of the wound is a fine fleſhy placenta like maſs; and, after diſſecting with the knife through a great thickneſs of parts, the artery is not to be found; or only by thoſe who are very perfectly acquainted both with theſe changes and with the natural place of the veſſel. This is the confuſed fleſhy like maſs into which the ſurgeon ſtrikes his needle. Here the blood is ſeen oozing, as through a placenta, at many places, but not one of thoſe bleeding points correſponds with the mouth of the artery; ſo that when the ſurgeon ſtrikes his needle at theſe bleeding points, he muſt fail. The oftener the blood burſts out and is ſuppreſſed, the more does the wriſt thicken; the farther is the artery removed from the ſurgeon, and the more confuſed the parts become. It is by this extravaſation into the cellular ſubſtance that the ar-

tery always diſappears, and the bleeding ceaſes, before the ſurgeon is ready to take it up with the needle: The patient loſes blood from day to day, he becomes pale, ſickly, and exhauſted, till at laſt the blood hardly retains ſo much colour as to tinge the ſheets *.

But another phenomenon often preſents itſelf, a natural conſequence of this ſtate of the parts. A perſon is brought to us a week after the radial artery is wounded; it has burſt out again and again; perhaps the hæmorrhagy has been ſuppreſſed by ſponges, by compreſſion, or by a rude ſtroke of the needle; but, upon undoing the dreſſings, we are ſurpriſed with the appearance of a diſtinct aneuriſm in the bottom of an open wound; we ſee a ſmall diſtinct pulſating tumor, regularly circumſcribed, throbbing ſtrongly, with thin and almoſt tranſparent coats. We are at firſt at a loſs to imagine how ſuch tumors are formed or ſupported. But though the wound be open, the artery is not ſo; the cellular ſubſtance is partly injected with blood; the firſt effuſion of blood is driven into the cellular ſubſtance, mixed with it, and firmly coagulated; the ſecond effuſion has filled more of the cellular ſubſtance with recent and fluid blood, and raiſed it in the form of an aneuriſm; and this aneuriſm has for its tranſparent coat the general faſcia of the wriſt; but yet it is ſo fairly circumſcribed that one would hardly doubt of its being a dilatation of the artery itſelf.

If I do not miſtake the importance of this accident, it is a ſort of duty to explain it to you ſtill further; for though the operation of tying the radial, or ulnar artery, does not range in the catalogue of important operations, along with trepan and amputation, yet, if I be not deceived, it is more difficult than either, and certainly more frequently required.

" A ſhoemaker having been at an annual dinner with ſome young men of his own trade, had got merry, but was not intoxicated; and ſome of his companions walking home with him, he ſwore a hearty oath that they ſhould not paſs his door without taſting a glaſs. Accordingly they went in along with him, and as he was reaching up to a cupboard for a bottle of ſpirits, an unlucky foot encountered his, and tripped him. He fell forward, and a nail which ſtuck out from the wall run into the palm of his hand, and wounded the Palmar Artery.

* Many caſes may be found in White, O'Halleran, Aitken, &c. where a perſon wounded in the radial artery has bled for three weeks or a month, till the blood was little better than a reddiſh ſerum. I have taken up the radial artery after a perſon has been ſuffered to looſe blood ten or twelve times during the courſe of a fortnight.

Inſtantly there was a dreadful bleeding. He fell down at laſt in a faint; and ſo unſkilfully was this poor fellow managed, that, in the courſe of a fortnight, he had been allowed to bleed no leſs than eight times. The blood burſt out afreſh on the ſlighteſt motion, and at intervals of no more than two days, till he was reduced to extreme weakneſs. He had loſt immenſe quantities of blood. It was only by his ſhape that I could perceive that he had been originally a fine athletic and healthy young man."

"I found him, indeed, in rude hands. The ſurgeon who had attended him, and who was to perform the operation, knew nothing of the palmar arch, where it began, or to which of the two arteries it belonged, nor whether it lay above or under the ligament of the palm; and ſo much was he alarmed, and ſo ignorant of any but the rudeſt means of ſtemming the torrent of blood, that he had a coarſe bandage twiſted round the hand as firm as a tourniquet! The tourniquet itſelf was ſtill round the arm hard ſcrewed; and the hand, by long continued preſſure, was now black, not merely from extravaſated blood, but from actual gangrene; veſications appeared on it betwixt every turn of the roller. The palm of the hand was greatly heaved up and ſwelled, with a puffy kind of ſwelling. In ſeeking for the artery the thick ſkin of the palm was firſt cut through; it was very thick, and exceedingly crammed with blood. The cellular ſubſtance, belonging to the palmar aponeuroſis was crammed alſo with blood, was fully two inches thick, quite black; it was all one uniform maſs, which cut like the Corpus Spongioſum Penis, and no one part was to be diſtinguiſhed from another.

The artery, with its uſual perverſeneſs, (though it had almoſt bled the man to death), would not give one drop of blood during the operation. The ſurgeon unſcrewed the tourniquet, douſed the parts with warm water; made the patient ſwing his hand moſt painfully; made ſeveral rude inciſions, but ſtill could get no jet of blood from the artery, nor any more than a general oozing from this ſpongy maſs. Without fear of the palmar nerves, he made many relentleſs and unſucceſsful dips with the needle; at laſt he was moſt unwillingly forced to make an inciſion upwards along the artery: he cut the ſkin by the ſide of the flexor ulnaris muſcle, and looked in vain for the artery: was ſurpriſed that he could not ſee an artery which he felt plainly with his finger, not knowing that the artery was ſtill covered with its faſcia;—but having at laſt ſlit up the faſcia, the artery was forced out by the tenſeneſs of the faſcia; and from its

fulneſs, it aſſumed a contorted form, and was eſpecially turgid at each pulſation. Three inches of the ulnar artery now lay expoſed; it was ſeen running over the Piſiform bone into this ſpongy maſs in the palm; the artery beat ſtrongly, and was ſeen ſerpentine, and working with a ſort of ſpiral motion, and a diſtinct pulſation; but there was no correſponding jet of blood, nothing but a general oozing in the palm."

"The concluſion of the caſe is as extraordinary as all the reſt of it; the ſurgeon laid a ligature under this part of the artery, but would not draw it; he made another deſperate dip with the needle: The lad was put to bed, and the bleeding broke out ſo furiouſly in the night-time, that had there not been a pupil watching to tie this occaſional ligature, he ſurely muſt have loſt his life."

This caſe explains to us what confuſion the continual driving of the blood makes; how deep the artery lies in parts which ſeem to have little cellular ſubſtance, and how vain it is to look for the artery in the midſt of ſuch a maſs; the artery will not bleed till all is quiet again; and even when it does bleed, it is not with a fair jet, nor with open mouth. To ſuppreſs ſuch bleedings with a ſtyptic, or a compreſs, ſeems to be a lenient, but is, truly, a cruel practice, and not without danger. The patient's conſtitution, if not his life, is often endangered before the ſurgeon gets courage to make the inciſion; and at every return of hæmorrhagy the cellular ſubſtance is more and more injected; the artery buried deeper; the inciſion muſt of courſe be more extenſive, and the operation more difficult.

The aneuriſm which I have deſcribed, as formed under the faſcia, and protruding from the bottom of the wound, I chooſe rather to exemplify from the writings of another perſon, than from my own caſe-book. Mr. Ford, of the Weſtminſter Hoſpital, "was called to a butcher who had, about a fortnight before, wounded his wriſt, by puſhing his hand through a pane of glaſs. The wound was juſt below the Carpal ligament, over the piſiform bone. It had bled ſeveral times ſince the accident, and the hæmorrhagy had, with difficulty, been reſtrained by bandages and common dreſſings. *There was a pulſating tumor covered with a thin membrane, where the wound had been received;* the pulſation was with difficulty checked by a ſtrong compreſſion on the ulnar artery, but returned again on removing the compreſſion.

I dilated the wound inſtantly, ſays Mr. Ford, towards the palm of the hand, and made an attempt to include the veſſel within a ligature, by means of the common crooked needle. This proving ineffectual, I repreſented to the patient the neceſſity

of a farther dilatation of the wound, in order to reſtrain the hæmorrhage, without injury to the ligaments and tendons of the wriſt; but, notwithſtanding the moſt urgent entreaties, he could not be prevailed on to ſubmit to any farther operation till the enſuing day: he was therefore left with a bandage on the wound, and the tourniquet applied on the upper arm, with directions to tighten it if the hæmorrage ſhould return."

"I ſaw him again on the next day, in company with Mr. Lynn, ſurgeon of the Weſtminſter Hoſpital, and finding that the bleeding had recurred, it was determined to proſecute the inciſion farther, and to ſecure the artery higher up in the arm."

"I began the inciſion where the wound had been received, carrying it ſuperficially over the carpal ligament, in the direction of the ulnar artery, for ſix inches upwards in the arm.

"The operation was done with the utmoſt caution, to avoid wounding the tendons and muſcles, which were carefully held aſide with our fingers as they were expoſed by diſſection. This proceeding was of courſe tedious, in order to enſure ſafety. The pulſation of the veſſel could not be felt; neither could the hæmorrhagy be provoked by friction, by putting the arm in warm water, or by flannels applied hot to the part. At length, however, the artery was diſcovered, and a ligature carried round it, without including any other part, about an inch and a half above the wriſt. Some time was then employed in endeavouring to promote a hæmorrhage from the lower branch of the artery; but this not taking place, the wound was carefully cleaned, united with ſtrips of ſticking plaſter, and rolled up with a flannel roller."

"The patient was bled, had an opiate adminiſtered, and in every reſpect was treated in a moſt antiphlogiſtic manner. No circumſtance occurred to render it neceſſary to open the wound for ſix days; no ſwelling, tenſion, inflammation, or fever came on. Now, it may be remarked, that the circular ligament of the wriſt, together with the tendons and muſcles contiguous to the ulna, had been laid bare, and expoſed to the air for more than three quarters of an hour, during our ſearch for the artery. The ligature came away on the eighth day, and the wound healed rapidly by the firſt intention, ſo that the patient was perfectly well on the twenty-eight of the ſame month."

I know Mr. Ford, and am ſure he will pardon any obſervation that is meant for the improvement of others. I believe it is needleſs, in any ſuch caſe, to cut

downwards into the palm of the hand, which is uſually ſo injected with blood, that the moſt dexterous anatomiſt, diſſecting deliberately on the dead body, would not find it eaſy to ſhow the open mouth of an artery; and it were ſuperfluous to repeat to you how improper it is to dive with a great needle into the palm of the hand; nor is this neceſſary! for the palmar faſcia and ſkin are ſo ſwelled, as to prevent the return of the blood from the lower mouth of the artery. I never ſaw it neceſſary to tie the lower end of the artery, and I think it important to mention this as an exception to the rule commonly laid down of tying both ends of it, it is only the direct impetus of the blood from the upper part of the artery that burſts through this injected and ſpongy maſs; it is only the upper end of the artery that we need to tie. Irregular and unſucceſsful operations are performed only from not having a very decided intention of diſſecting for the artery; but it comes always to this in the end; and the ſurgeon ſhould reſolve, the moment he is called to ſuch a caſe, to apply the tourniquet to cut backwards along the artery; to diſſect it clean; to tie it fairly; to diſregard the bleeding from the lower end of the artery; to put a ſmall piece of ſponge into the place where the blood wells out from this confuſed maſs, except in thoſe very rare caſes where he ſees a direct jet of blood from the lower end of the artery, and then he may uſe the needle; but that rarely happens, except in very recent caſes, and before the palm is much injected with blood.

* Surgeons from the very earlieſt times have been fully ſenſible of the danger of this wound in the wriſt; inſomuch, that finding often their ſtyptics, vitriol buttons, pellets of chewed paper, and hard compreſſes, with coins in them, ineffectual! they invented a particular machine for the wound of the artery of

* The juſtly celebrated Mr. White, relates the conſequences of bleeding from the Radial Artery, in the following terms: "The arteries of the wriſt having been cut, had been twice taken up by Mr. ——, a ſurgeon well accuſtomed to the operation; and boviſta and many other things had been tried. After each of theſe methods, the hæmorrhagy ſtopped for a few hours, and then frequently burſt out again; eſpecially upon the acceſſion of a hot fit, to which he was now very liable. On the ſeventh day I was called, in conſultation with Mr. Allan, to take off the arm: we found his hand and arm ſwelled to three times its natural ſize, from the frequent uſe of the tourniquet, which had been under a neceſſity of being moved to different parts of the arm, on account of the excoriations it had occaſioned. For the laſt twenty-four hours it had been applied almoſt without intermiſſion, from a dread of his bleeding to death, as he had loſt a prodigious quantity of blood. After the dreſſings and clotted blood were removed, we could diſtinctly ſee the mouth of the veſſel, throwing, per ſaltus, what I can ſcarcely call blood, as its colour could hardly be diſtinguiſhed upon linen."—WHITE'S CASES.

the wriſt, and a more formidable machine can hardly be imagined. It is formed of two great hoops of iron, connected by three flat iron rods, with ſtrong hinges, and ſtudded with iron nails to give it ſtrength; it reſembles our machines for broken legs, and moſt of all Gooch's machine for the fractured thigh bone. One circle goes round the elbow, another ſurrounds the wriſt, and within this circle is a large padded compreſs, moved by a ſtrong ſcrew, which compreſſes the artery. The very form of this machine ſhows the extent of their fears; much more the words in which Scultetus explains it: "Comprimitur arteria carpi conſilio aut fortuito aperta, ne vitam cum ſanguine profundat *:" And he adds, "that it is peculiarly ſerviceable in ſuch punctures of the arteries of the carpus, as ſometimes happen in duels with the ſmall ſword." The means of ſuppreſſing hæmorrhagy were imperfect among the older ſurgeons; and it was not without reaſon they feared theſe wounds of the carpus: We have, in the following caſe, a proof at once of the difficulty with which they reſtrained ſuch hæmorrhages, and of the ill conſequences of ſtyptics and compreſſion.

"One John Moſer, a ſhoemaker, having a diſpute with his apprentice boy, the wicked imp, while he was ſtruggling with him, cut him acroſs the wriſt with a paring knife. The vein and artery being wounded, he bled profuſely, with other diſtreſſing accidents. A regular ſurgeon being called immediately, bound up the wound according to art; but next day the blood burſt out ſo profuſely, that he was agitated with univerſal convulſions. On the ſeventh day it burſt out again; he ſaid that all night long he had dreamed of ſtruggling with the boy; and in the morning, wandering up and down lamenting the expences of the affair; he wrought himſelf up into a fever, ſo that the blood burſt out again with all its violence, and could by no means be reſtrained, till Scultetus clapping his finger upon the mouth of the artery, and hooking out a great quantity of coagulated blood from the wound, laid a piece of burnt ſponge upon the artery, dipt in aſtringents mixed up with whites of eggs; bound up the wound with firm bandages, and put the great ſpring bandage, which I have juſt deſcribed, over all. In this caſe we may obſerve what quantities of blood the patient loſes in theſe wounds; and by the

* Conſilio aperta muſt be explained.—"At Pavia, ſays Scultetus, where anatomy and ſurgery have flouriſhed for many ages, there appeared in my own day a moſt dexterous Arteriotome, who, at the inſtance of the Phyſicians, made very free with the Radial Artery, and, by opening it at the wriſt, cured the moſt ſevere diſeaſes of the head; and he uſed this compreſſing machine, ſo that not one drop of blood iſſued; nor did any bad conſequence of ſuch compreſſion ever enſue."

reports of Scultetus, we are made ſenſible of the great ſufferings this particular patient muſt have endured; for, on the ninth day, the arm was greatly inflamed; on the tenth the patient was ſomewhat relieved, and the yellow pus began to ſoak through the bandages: On the eleventh he was tolerably well; on the twelfth the wound was dreſſed. The wound was very large, both from the quantity of coagulated blood that had been hooked out, as from the cavity of an aneuriſm; and by the dilatation of the ſponge, and the tendons of the wriſt were expoſed, and not only inflamed, but even tending to gangrene *."

We find Scultetus ſcrewing his compreſſing machine at every dreſſing, getting away the ſponge very ſlowly, and piece-meal, the pain conſiderable, the matter in great profuſion, the ſufferings of the patients in all reſpects very great; and I have no doubt, that, by ſuch long continued ſuppuration, the tendons would be fixed in their places, and the hand would continue lame. But not even the coarſeneſs of this machine, nor the manner in which they uſed it, nor their irregular practice of uſing ſometimes compreſſion, ſometimes vitriols, ſometimes the hot iron itſelf, in wounds of the wriſt, can explain to us the extent of their difficulties and fears. Mr. O'Halleran's operation, though not new, (for it was performed by Parée, Guillemeau, and even by the Arabians), is more deſperate than all theſe:

* Septimo die noctem inquietam habuit, dixitque ſe tota nocte per ſomnum cum puero, qui ipſum fauciavit, pugnaſſe: et quod majus eſt: conqueſtus eſt de ſumptibus, et propter illos tam melancholicus fuit, ut huc et illuc in hypocauſto curreret, a quo motu ſanguis ebulliens ex arteria læſa, in omnem dimenſionem exſiliit, ut nullo modo ſiſti queat. Itaque digitis compreſſa arteria, in media radii parte, extraxi magnam ſanguinis concreti copiam ex vulnere. Tandem arteriæ ſauciatæ ſpongiolam combuſtam, et pulvere lapid. chryſol. præp. atque adſtring. Gal. aſperſam, et albumine ovi agitato oblinitam impoſui, conveniente faſcia vulnus obligavi, et inſtrumentum ex bractea confectum Tab. XLIII. adhibui, quod obſerari, et cochlea arteriam comprimere citra incommodi metum poſſit.

Octavo et 9. die quia manus uſque ad mediam cubiti et radii partem inflammata erat, veſperi admiſit Enema. Decimo die melius habuit, et pus flavum per faſcias ſudavit. Die 11. per totam noctem bené dormivit. Duodecimo die religato vulnere effluxit pus album, et vulnus latius apparuit, ob ſanguinis concreti extractionem (ut in aneuriſmate fieri ſolet.) et impoſitam ſpongiam. Tendines quoque perforantes in conſpectum venerunt inflammati, et ſummo cum dolore ad putredinem tendentes. Vulnere igitur, citra ſpongiolæ extractionem, deterſo, arteriæ medicamenta prædicta impoſui, vulnuſque faſciis obligatum iterum inſtrumenti clavo obturavi.

Die 13. et 14. æger melius habuit, inflammatio namque et dolor manus læſæ aliquantulum remiſit. Die 15. pus album de vulnere exivit, manus dolor remiſſior viſus, et tumor ejuſdem minor factus fuit, tendineſque calorem naturalem acquiſiverunt. Die 16, Dimidiam ſpongiolæ, quæ arteriæ inciſæ orificio adhæſit, partem voſſella extraxi, alteram vero reliqui ad foramen arteriæ, &c.

" He takes, to uſe his own words, the largeſt convex needle, armed with ſix or eight threads, made flat and ſmooth with wax, pierces the ſkin about an inch above the wound, and near the ſame diſtance from the beat of the artery at one ſide ;—he paſſes the needle firſt under the artery, and out at about half an inch diſtance on the other ſide of it. The threads being thus paſſed, and comprehending the artery, and the ſurrounding fat and muſcular fleſh, let a ſmall roller of fine linen, not made up hard, be placed over the artery, and on this let the ligature be made," &c. And he ventures even to give examples of caſes ſo deſperate as to require this very deſperate operation †. I would not have you

† A gentleman of this city, in May 1762, by ſome accident ſtruck his left hand through a pane of glaſs. A pretty conſiderable wound of the wriſt was the conſequence. The radial artery was alſo cut through, and ſome ſmaller ramifications were wounded. The arteries bled very freely ; and ſoon after I was ſent for, finding compreſſion not anſwer cleverly in this caſe, he being a little heated with liquor, I took the reſolution of making the ligature of theſe veſſels, eſpecially as it was after night fall. This done, the bleeding ceaſed, and I dreſſed the ſores with ſoft lint, applying a cuſhion of tow to the bend of the arm, to break the force of the blood, which was ſecured by a proper bandage. The ſore was not opened for two days after ; and every thing went on in a very promiſing way. In about ſeven days the ligature dropped off ; and I now recommended to him the greateſt caution and temperance. He, nevertheleſs, made uſe of this hand on every occaſion ; and as my advice was not paid the deference I imagined due to it, I inſiſted on being diſcharged, which was complied with. For it was imagined I made much more of the affair than it deſerved. But though the ſore healed up, yet, in about three weeks after, upon ſome very violent effort, the radial artery ejected blood with great impetuoſity ; and I was again, with many entreaties, requeſted to viſit him. I clapped a good deal of lycoperdon on this part, which I preſſed on with my finger ; over this a good deal of ſoft unformed lint, a compreſs over the artery, and ſecured the whole by a ſtraight bandage ; and, as the pulſe was very full, took ſome blood from the other arm. Things remained thus for about five days ; when, upon ſome exceſs, a freſh hæmorrhagy came on, which was again maſtered. In two days more, it began again ; on which I had Mr. Mahony, a good operator and ſurgeon, called in. The following morning it came on very violently ; and, apprehenſive that ſuch frequent relapſes would endanger his life, amputation became ſeriouſly thought of. I, however, told them I had one means more unattempted, before we ſhould come to this diſagreeable neceſſity ; and the next day I had full occaſion to put it to trial : For, on ſome very ſlight motion of the hand, it bled with great profuſion, and I was ſent for. In this ſituation, in the preſence of the other ſurgeon, &c. I paſſed a convex needle, armed with three threads, ſmooth, flat, and well waxed, about three fourths of an inch higher up than the gaping orifice of the artery, and at ſome diſtance from this veſſel ; pierced the ſkin and fat, conveyed my needle under it, and again out at the other ſide of the artery ; put ſome lint, between the ſpaces of the wounds, over the artery, and on this made a pretty tight ligature. All bleeding immediately ceaſed ; the orifice of the artery ſoon healed ; the ſkin became firm over this part ; in about a fortnight after, the ligature caſt off ; and he now has the uſe of that hand as firm as the other. Thus by a *new, and truly curious operation, was a limb preſerved ; and will, I*

entirely ignorant even of this rude operation which O'Halleran, a very excellent ſurgeon, manifeſtly conſiders as new and ingenious, as a happy invention, which ſaved the perſon's life, and " which he thinks will be the means of preſerving the lives of others."

I hope not. I hope that you will be able to ſave the lives of your patients on eaſier terms. There is nothing peculiar in this radial artery; the confuſion ariſes from thoſe cauſes which I have endeavoured to explain. The confuſion of parts is from the driving of the blood! the temporary ſuppreſſion of hæmorrhagy but increaſes the danger; and ſucceſſive bleedings bring the patient to the brink of the grave, and have often occaſioned the loſs of a limb. There is no ſafety in truſting to compreſſion, ſponges, or aſtringents; for you are yourſelves never free from anxiety, nor your patients from danger; the blood burſts out again, and all thoſe intervals of expectation, and thoſe apparent ſucceſſes, only increaſe the difficulties of the caſe. To temporize is cruelty, and not mercy! for in the end it always comes to this, that you muſt make an inciſion, look for the artery, diſſect for it till you are ſure of your ſtroke:—You muſt uſe the needle, becauſe you ſucceed beſt by diſſecting upwards along the artery, and by putting your ligature round the artery itſelf, (and not merely by tying the open mouth of it). There is no artery of the body which you can diſſect for more freely than the carpal artery; you ſhould be able always to tie it without including, in your ligature, either the ſupinator tendon, or the Palmar Nerves.

This is my idea of the condition of a wounded artery, and theſe the practical inferences which I preſume to deduce from this ſimple theory.—But there re-

*hope, be the means of ſaving many others in ſimilar accidents.* Had ſuch a method been taken in the following caſe, a poor man might have preſerved his arm.

I alſo deliver the following caſe from O'Halleran, to ſhow you to what extremity this hæmorrhagy from the ulnar artery has ſometimes reduced the patient.

" The butler to a gentleman at ſome diſtance from this city, about ten years paſt, in wiping a glaſs, it happened to break, by which accident he received a conſiderable wound of the wriſt, in which the radial artery was divided. It bled violently, and with ſome difficulty was it maſtered by Mr. White, an ancient ſurgeon here. The bleeding returned in two days—again in five; and thus continued burſting forth at times, on the leaſt motion of the hand, for near a month. This great loſs of blood having greatly fatigued and weakened the patient, on a conſultation with the late Mr. Gould, amputation of the arm was reſolved upon, and performed on the very next return, by Mr. White, in the preſence of Dr. Martin; and the man ſoon recovered, but was rendered incapable of ſervice."

mains a ſubject of inquiry ſtill more important, I mean, the condition of a great artery when tied with a ligature, or reunited by compreſſion; for that diſcuſſion is a neceſſary prelude to my obſervations on great aneuriſms. Here, alſo, I am not afraid to acknowledge there is a connection betwixt theory and practice which it were hypocriſy to deny.

## OF THE CONDITION OF THE ARTERY IN ANEURISM, AND OF THE EFFECTS OF THE LIGATURES UPON THE ARTERY.

Even that aneuriſm, which proceeds from a direct wound of the artery, grows very ſlowly. When the brachial artery is wounded in bleeding, we find no tumor on the firſt day; on the ſecond or third day the aneuriſm begins to form, but is then no bigger than a pea; it is ſmall, round, hard, and circumſcribed; and ſeems attached to the ſide of the artery: it is a week before it attains the ſize of a walnut, and a fortnight before it is as large as a pigeon or hen's egg; and it is only at the end of ſix weeks that it acquires the full ſize of an aneuriſm, ſuch as is uſually the ſubject of our operations.

The old phyſicians obſerving this ſlow growth of aneuriſm; ſeeing the tumor regularly circumſcribed, and apparently attached to the ſide of the artery; imagining alſo, that they could preſs back the blood from the aneuriſacal ſac into the canal of the artery, could not believe that this artery was actually wounded! they believed it to be merely dilated; they conceived that the point of the lancet had touched the external coat only; that in ſhort the artery was pricked, but not wounded. They thought that the external coat being thus injured, the internal coats, no longer able to reſiſt, the impetus of the blood had given way *; or they believed, that though the outermoſt coat of the artery when wounded may in time cloſe again, yet the innermoſt coat being thinner, will not ſo eaſily

† "Quod in dilatata vena varix dicitur, in arteria preter naturam expanſa aneuriſma eſt." This is the definition with which Ruiſch begins his caſe of aneuriſm; and the opinion here expreſſed was indeed univerſal.

ſubmit to a cure as the other, ſeeing it is continually in danger of being further dilated by the impulſe of the arterious blood.

This laſt opinion I have detailed from Purmannus, the celebrated Sileſian ſurgeon, who ventures a ſtep beyond his compeers. They only gueſſed that the artery was dilated; he pretended to demonſtrate it! He not only delivers, in the following caſe, a formal narrative of the Brachial Artery, dilating from the diameter of a ſtraw to the bigneſs of a man's head! "without breaking the veſſel," which is no doubt "very wonderful to think of," but he is ſo adventurous as to give us a drawing of this ſac, as if he had tied two ligatures round the artery, and cut out the intermediate piece, with this ſac or dilatation as big as a man's head! One feels at every ſtep how dangerous it is to receive, too implicitly, reports, which are inconſiſtent with common experience and common ſenſe. The caſe is delivered by Purmannus in the following words:

"In the year 1680, I had in cure a gentlewoman at Halberſtadt, named Anna Peters, about thirty-eight years of age, who had a large aneuriſm upon her left arm of three years continuance, the form and bigneſs whereof may be ſeen in Tabul. 5. fig. 11. This misfortune came by a chirurgeon of Blanckenburg's letting her blood, who thruſt his lancet through the vena mediana into the artery that lay under it, which cauſed a tumor of a vaſt bigneſs. At my firſt handling the pulſe, I thought the blood run out of the artery between the muſcles; but afterwards I found the contrary, and that it was an extenſion and dilatation of the artery; which certainly is a very great wonder to think upon, that a veſſel no bigger than a ſtraw, ſhould extend itſelf to the bigneſs of a man's head, without breaking the veſſel. This gentlewoman was not ſenſible of any great pain; but her arm was extremely waſted, and in a manner utterly dried up; which was very ſerviceable to me, for I could ſooner find the artery; under both ſides whereof I thruſt a needle and ſilk, and tied it cloſe together, and, cutting it through between the two tyings, took it out very happily and quickly, with the aſſiſtance of Mr. Kraue, a chirurgeon at Quedlinburg; and the patient was cured in a month's time. Here I think myſelf obliged to acquaint you, that though this gentlewoman had worn ſeveral ligatures, compreſſors and leaden plates during the firſt year, yet it took its courſe, and nothing could have any effect upon it. The atrophia, or waſting of the arm, I cured with the balſam and mixture mentioned in the foregoing chapter."

There is hardly any author, indeed, who does not affirm the aneuriſm produ-

ced by a wound to be a true aneuriſm; and the imperfect reunion of the internal coat of the artery to be the cauſe of the dilatation. Thus, Tulpius, in mentioning a wound of the artery of the thumb, with a very ſharp pointed knife, ſays, "The external coat alone reunited, which being unſupported by the internal coat! was unable to bear the force of the blood *;" and even this breach of the internal coat, this "hiatus tunicæ internæ arteriæ," they thought they could cure, and yet preſerve the canal of the artery †.

Thus the old writers, who were rather ſpeculative anatomiſts than practical ſurgeons, imagined theſe ingenious, but puerile, theories, which ſtill hold their place in the ſyſtems of the preſent day; their refinements upon this ſubtile doctrine are endleſs. De la Faye, in the following paſſage, not only compares the blood forcing the internal coat of an artery to bulge through the wound of the external coat, like a hernia of the abdomen! but he purſues his ſpeculation farther; he adds, "It is important not to miſtake this aneuriſm ariſing from a partial dilatation for that in which all the tunics are equably expanded; for the former we often cure by compreſſion, but the latter never; becauſe the whole circumference of the artery being dilated, if you preſs it on one ſide, it will protrude on the oppoſite ſide ‡.

They did, indeed, remark the jetting of the blood as a ſign of wounded artery! but they willingly forgot this deciſive ſign of a direct wound, in favour of their darling theory of dilatation. They boldly believed, that even that aneuriſm which proceeded from a wound of the lancet was but a dilatation of the artery. Thence came the ſcholaſtic diſtinctions of aneuriſms, into true aneuriſms, proceeding from a pure dilatation of the artery; and falſe aneuriſms, proceeding from a direct wound of the artery; and mixed aneuriſms, where a true aneuriſm had terminated in a falſe one! or, in other terms, where an aneuriſm, conſiſting at firſt of a

* "Coaleſcit ſtatim magis externa quam interna arteriæ tunica QUÆ MANSIT HIANS, ac a ſeinvicem ſejungata. Eleveta propterea a vitali ſanguine uſque eo, externa ipſius membrana, ut degeneravit in verum aneuriſma."

† "A plumbi lamina arctioreque vinculo ita depreſſum: ut expulſo ex tumore ſanguine et conſtricto convenienter vulneris hiatu facilius coiret, aglutinaturque interior lacerta arteriæ tunica," &c. page 305.

‡ Cette eſpece d'aneuriſm dont l'auteur parle eſt occaſione par la diviſion d'une ou pluiſieurs, tuniques exterieures et par la dilatation des interieures QUI en PASSANS PAR L'OUVERTEURE DES EXTERNE FORMENT UNE ESPECE D'HERNIE. Il eſt important de ne pas confondre cette ſorte d'aneuriſm, avec ceux qui ſe font par la dilatation de toutes les tuniques; car on la guerrit quelquefois par la compreſſion, et ce moyen ne convient, pas ordinairement a ces dernieres parce qu' en compriment la tumeur, d'un, coté, elle croirait, au cotté oppoſé. Page 697.

mere dilatation of the arterial coats, had been burſt by violence, or had given way by over-diſtenſion, ſo as to pour out its blood into the cellular ſubſtance. Then it was, that ſurgeons conceived the romantic hopes of repreſſing thoſe protruſions of the arterial coats, without interrupting the courſe of the circulation in the main artery; or entering upon a bloody operation which they did not underſtand; or endangering gangrene, which never was out of their thoughts: that gangrene! which has been ſo long the bugbear of ſurgery! They imagined, that even the wound from the lancet healed; and that the artery dilated from the injury done to its coats; they ſuppoſed it to be dilated from weakneſs; they compared this dilatation of the artery with the yielding of the peritoneum in hernia; and the dilatation of an artery like the protruſion of a gut, was oppoſed by a ſpring bandage. The artiſts who made bandages for hernia of the groin, made ſpring bandages for this imaginary hernia of the arterial coats, by the ſame rules and principles.

They were at the ſame time ignorant of all the laws of the circulating ſyſtem; and full of this expectation of healing arteries by compreſſing the wounded point; and they were withal ſo fearful of this terrible gangrene, that they never ventured to perform the radical operation for aneuriſm. Ruiſch was the firſt, in the great city of Amſterdam, who found courage to tie the artery of the arm *; and even he operated only after the aneuriſm had burſt ſpontaneouſly! But to tie the artery of the arm higher than the bending of the arm, was eſteemed a problem even in the days of Sharp and Cheſſelden. The older ſurgeons cured only by compreſſion; their Annulus Ferreus was a great ſpring bandage for compreſſing the dilated artery; they made their patients wear theſe awkward and uneaſy inſtruments ſleeping and waking for a full year, before they ventured to pronounce the cure perfect; and then they applied their Scutum Eburneum, an ivory compreſs, upon the artery! a ſort of defending bandage, which ſome patients, for fear of future dilatations, wore for life.

When the celebrated Heiſter had obliterated a wound of the femoral artery, or to ſpeak more correctly, had obliterated the femoral artery itſelf, by puff-ball, gradu-

* Unanimiter cutis inciſionem et arteriæ conſtrictionem commendavimus. Operatio ſane ab actoribus magis commendatum et laudatum quam inſtitutam; quod dicere non gravor quia viginti abhinc annis et quod excurrit, in hac vaſta civitate, ad quam ſine numero confluunt afflicti hanc operationem in arteria adeo ingenti nullus quantum noverim chirurgorum inſtituit. Ruiſch, page 5.

ated compreſſes, and a very firm rolling of the limb, we find him expreſſing the ſame fears about the dilatation of the artery, and taking every precaution to prevent this accident. Before he removed thoſe compreſſes, by which the wound had been healed, he had others ready of a peculiar conſtruction, to prevent this dilatation, which, according to the doctrine of that day, was likely to follow ſuch a wound. His fear was, leſt the new and ſoft cicatrix of the artery ſhould, in the ſoft condition, give way and dilate, (" adhuc ſollicitus de aneuriſmate avertendo, Subovatam laminam quando metallicam diu geſtandum lauſit, ut ſic recens nimiſque mollis tunc adhuc arteriæ cicatrix, donec probe induretur, compreſſa ſervetur.") He imagined even a wound of the great femoral artery to be healed by compreſſion. He imagined the wounded part of the artery to have a cicatrix too ſoft and delicate to bear the current of the arterial blood! He imagined that it was neceſſary to guard againſt ſuch dilatation, by an oval compreſs of metal, bound upon the thigh with a leather belt; and worn, as we find by this particular patient, for life *.

At laſt they ventured to open the aneuriſmal tumor, and clear the ſac of blood; but it was not for the purpoſe of performing the radical operation;— they did not venture to follow the Arabian practice of tying the main artery, and cutting it acroſs, ſo as to let it ſhrink into the fleſh. Their doctrine of dilatation was ſtill inviolate; and they ſtuck to their practice of compreſſion; they cleared away the blood, ſought out the wound of the artery, clapped a pellet of chewed paper upon it, and piled compreſſes upon this firſt compreſs of chewed paper. Thus they believed that they cured the wound in the artery by adheſion;

* " Denique cum ad finem fere curatio perveniſſet Ill. Dn. Præſes, uberius adhuc ſollicitus fuit de aneuryſmate avertendo, id quod alias facile, licet ejuſmodi vulnera etiam ſanata ſint, poſtea adhuc ſupervenit (l). Ad hoc vero præſtandum, non ſolum ſubovatam laminam quandam metallicam, quinta vel ſexta deligatione, ut modo § XXXIII. diximus, vulneri ſuperimponi curavit, verum etiam machinam aptam coriaceam ægro propoſuit, quam ipſi, ſanato etiam vulnere, circa locum vulneris diu geſtandam ſuaſit, *ut ſic recens nimiſque mollis tunc adhuc arteriæ cicatrix, donec probe induretur, compreſſa ſervetur:* ' quia alias facile, niſi ſic impediatur, aneuryſma periculoſum ſequeretur.' Hoc cum vulneratus intelligeret, ipſe ſibi hujuſmodi machinam confecit, quam fig. 2. et 3. exhibemus, et quæ ita ſe habet."

This patient, who made the bandage for himſelf, according to Heiſter's direction, was a ſhoemaker, who had wounded his femoral artery with the paring knife: And Andreas Reinig, who relates the caſe, adds, " Hoc vero ſolum adhuc indicare volui quod vulneratus hac machina adhuc dum utatur.

We find the celebrated Mr. Foubert, about forty years ago, modelling a new compreſſing machine after the plan of thoſe of Dr. Bourdelot, and of Scultetus.

and, when this method failed, they were ſo fearful of interrupting the main trunk of the artery, that rather than tie it they ſcrupled not to cut off the arm or thigh as their laſt reſource *.

We cannot pretend to ſay what are the expectations of modern ſurgeons in reſpect to this reunion of the lips of a wounded artery; but if we may judge from books, the doctrines of true, falſe, and mixed aneuriſms are in full force at this preſent day. There are many weak men ready to believe, that the aneuriſm which follows bleeding ariſes merely from a wound of the external coat of the artery; and there are many truly great men who believe, that the abſolute wound of an artery may be united by compreſſion; we find even Deſſault, the celebrated Deſſault, healing wounds of the brachial artery with pellets of chewed paper. The recovery of a limb, whoſe main artery is wounded, is ſtill reckoned doubtful; and ſurgeons, fearful leſt the inoſculations of the articular or collateral arteries ſhould not be ſufficient to ſave a limb, are to this very day anxious to diſcover ſome new operation by which the wounded artery may be cured, and its canal preſerved pervious. The late Mr. Lambert ventured to perform the operation of the hare-lip future upon a wounded brachial artery; and I confeſs that I was ſo imprudent as to repeat this experiment myſelf; but this honeſt avowal of my ill ſucceſs will, I hope, be eſteemed a ſufficient compenſation for any raſhneſs I may be thought guilty of; and let it be remembered, in extenuation, that this operation had been boldly proclaimed ſucceſsful †.

We may venture to affirm, that nothing has been more unfavourable to the improvement of our ſcience than this traditionary nonſenſe, delivered down

* Our own great ſurgeon, Wiſeman, ſeems to have been the only one who was bold enough, or ſufficiently accuſtomed to diſſection and actual operations, to withſtand this favourite doctrine of true and falſe aneuriſms. He alone thinks and judges for himſelf. He ſpeaks from his experience in operations. He contradicts it flatly. He ſays, "This I was taught myſelf, and ſome while believed; but not having been able by my practice to diſcover one aneuriſm made by dilatation or relaxation of the outward coat, I am apt to believe there is no ſuch thing, but that it takes its riſe from blood burſting quite through the artery into the interſtices of the muſcles, where it raiſeth a tumor ſuitable to the cavity, growing bigger or leſs, of this or that ſhape, as the muſcles give way. But this tumor conſiſts of blood extravaſated, the artery lying undilated the while. I do therefore ſuſpect the poſſibility of an aneuriſm by the dilatation of the outward or ſofter coat of the artery; becauſe it ſeems improbable that a force big enough to burſt the inward coat, which is ſo tough and firm, ſhould leave the exterior, being ſofter and weaker, whole, and go out ſo leiſurely into it as to give it time for dilatation. Thoſe which I have met with did all *come from downright eruption through both the coats.*"

† I ſhall have occaſion to mention this operation preſently.

from one ſyſtem to another, paſſing from hand to hand, among formal book-makers, " unum alterum inſequentes ſicut grues*;" who fly all in a row like geeſe. This imaginary wound of the external tunics, with dilatation of the inward coat of an artery; theſe ſcholaſtic diſtinctions, of true, falſe, and mixed aneuriſms; theſe uncertain reports, about curing aneuriſms by compreſſion; and this vain expectation, of healing a wounded artery, by reuniting the lips of the wound, have not as yet been replaced by any true pathology of a wounded artery.

## OF THE WOUND MADE BY THE LANCET.

Firſt, It muſt be obſerved, that an artery is not pricked merely in its external coat; and the proof is this: Our legiſlature does not prevent the moſt ignorant from meddling with a profeſſion, which ſhould be ſacred as the prieſthood,—maſons, butchers, gardeners, cow-herds! are among the chief phlebotomiſts in this country; and it is to them that we are indebted for the various ſpecimens of aneuriſm. They uſe very blunt lancets; and a blunt lancet being puſhed rudely onwards ſtarts through the ſkin at laſt, and ſtrikes deep into the arm. The aneuriſm is generally produced by a very large and rude wound, like that which the point of a penknife would make. I have ſeen many ſuch aneuriſms, and operated on ſeveral; once, when the operation was performed by another gentleman, I ſaw the artery ſo wounded, that it was held together merely by a tag; the cut in it was indeed oblique, but ſo large that it had ſevered the artery almoſt entirely acroſs. In an operation which I performed myſelf, I propoſed uſing only one ligature, being well aſſured that a ſingle ligature, applied round the wounded part of the artery, would obliterate the artery to a conſiderable extent, above and below; but, upon opening the ſac, I found the ſlit in the artery ſo very long, that I was forced to apply two ligatures in the uſual way. In another operation, I found the great artery running over the fore part of the tumor, and beating ſtrongly; I ventured to prognoſticate, that, upon opening this aneuriſm, we ſhould find either the brachial artery dividing high in the arm, or the artery ſo transfixed as to allow the blood to paſs all out by the back of the artery; and accordingly, upon opening the arm, we found the artery entirely

* Guy de Chauliac

transfixed! When I paſſed my probe into the artery, it paſſed through the other ſide, and the artery hung ſuſpended over the probe. The artery had been transfixed with a terrible gaſh; the preſſure of the compreſs and bandage had hindered the blood from coming out from the greater wound on the fore part of the artery; it had all gone out from the ſmaller wound on the back of the artery, the blood of courſe was collected behind it, and the artery was ſo raiſed upon the fore part of the tumor, and ſo preſented to the operator's knife, that, had the aneuriſm been opened raſhly, it muſt have been cut acroſs. From theſe deſcriptions, and the difficulty of ſtemming the blood at the time of the accident, and the rudeneſs of the people by whom this fault of ſtriking the artery is committed, we have reaſon to believe that it is wounded always with a very rude gaſh, and ſometimes abſolutely cut acroſs.

Among ſurgical writers, I find frequent and undeniable proofs of the fact which I have here affirmed; I have obſerved, that, in proportion to the largeneſs of the wound, is the ſize of the aneuriſmal tumor; I have never obſerved any aneuriſm increaſe ſo rapidly as to threaten burſting, except thoſe in which the wound of the lancet was ſingularly large; we have few caſes of aneuriſm abſolutely burſting, except thoſe related by Ruiſch and Saviard; in the one the artery was entirely burſt by a violent exertion of the arm; in the other (in Ruiſch's I mean) it was cut acroſs with the lancet. And in this caſe mentioned by Ruiſch, the aneuriſm appeared at firſt no bigger than a large pea, (ſo firmly do the parts reſiſt the artery even when it is wounded); but it grew ſenſibly from day to day till it burſt at laſt, (ſo powerfully does the artery act when largely wounded). That this artery was largely wounded we muſt preſume from the narrative which follows the caſe; for the ſurgeons having ſtopped the immediate flux of blood with boviſta and compreſſes, proceeded then to their radical operation of tying the artery; and, upon making the inciſion, and ſcooping out the blood, the blood flowed from two ſeparate points; by which it would appear that the artery had been abſolutely cut acroſs: ("Multum cruoris per-vulnus aneuriſmatis expreſſit, et porro brachium ſecundum longitudinem ſat profunde incidit, ut ſanguinem coagulatum levi compreſſione facta auferret, et gangrenæ eo commodius opem ferret. *Hoc facta inciſione* ſanguis arterioſus, *duobus e locis* magna vi erupit," Ruiſch.) In ſhort, the fact is ſo plainly affirmed in this paragraph, that unleſs we are to ſuppoſe ſuch a ſurgeon as Adrianus, aſſiſted by ſuch a counſellor as Ruiſch, to have gone to

work ſo very unſkilfully, as to have cut the brachial artery acroſs during the operation with the knife, we muſt allow the artery to have been entirely divided by the lancet *.

The celebrated Guattani conſiders a falſe aneuriſm, or, in other words, a true wound of the artery, as a rare accident; he, as well as the older ſurgeons, explains the aneuriſm ariſing from the puncture of the lancet, as ariſing "from a wound of two or more of the five coats of which an artery is compoſed; the internal coat being of courſe no longer able to ſuſtain the impetus of the blood †; and yet we find in the book of Guattani a wound of the brachial artery as deep as can be imagined, the artery certainly transfixed, and the caſe reſembling, in all its eſſential circumſtances, that which I have juſt mentioned. "In one patient, ſays Guattani, I found the arm ſo crooked, and with ſuch an inveterate rigidity of the biceps, both from the poſture of the arm, and the inceſſant application of ſtrong ſpirituous fomentations, that there was no extending the arm ſo as to get at the artery to tie it, nor any way of ſaving the patient but by cutting off his arm, which I did upon the 27th day, aſſiſted by the celebrated Pietro Javina. Having got the arm carried home, we proceeded to examine it, and happily diſcovered the cauſe of this ſingular difficulty, both in finding and in tying the artery; for the artery, far from lying in its natural ſituation, was entirely diſplaced by the extravaſated blood which raiſed up the whole bend of the arm in the form of a tumor, and preſſed the trunk of the artery ſo before it as to lay it cloſe againſt the internal ſurface of the ſkin ‡."

This was ſurely a caſe ſimilar to that which I have juſt deſcribed. The artery

* The artery being cut almoſt entirely acroſs, is, I am perſuaded, a very frequent accident.—"Neapoli, 1644, Menſe Martio quum venam ſibi juſſiſſet ſecari, arteriæ paſſus eſt inciſionem, ſequutum aneuriſma quo neglecto abſciſſum brachium; viſus illo abſciſſo MAGNUS ARTRIÆ HIATUS adhuc adverſus a las ſuperſtitis." Boneti, Tom. III. Appendix, "De infelice aneuriſmatis apretione." In thoſe days they made quick work with arms they injured in bleeding; they cut them off, and might have had very fine Muſeums, if it had been the taſte of the times.

† "Si ferri mucro ad cavum uſque haud pertingat *ſed ex quinque arteriam componentibus tunicis, duas tantum vel tres confodiat*, verum progignitur aneuriſma. Arterioſus ſanguis integras adhuc membranas jugiter feriens eas, peditentem ita diſtendit, ut *hernioſæ* tandem reddantur; poſt dies aliquot, hedomadas, vel etiam menſes prodit aneuriſma," &c.

‡ "Deinde quum domi meæ vulneris ſtatum ambo in arteriæ perſcrutamur, in maximam incidimus illam, cum inveniendi, tum quoque vinciendi difficultatem; hæc enim arteria non amplius in conſueto manebat loco, verum ab illo prorſus receſſerat ob effuſum concretumque ſanguinem, qui eam ſurſum propulerat uſque ad internam cutis atque pinguedinis faciem, concretam tegentem ſanguinem in cubiti flexione quæ tota in tumorem tollebatur."

had been not merely wounded, but quite transfixed with the lancet; the blood had been poured out upon the back part of the artery; the artery had been raiſed over the fore part of the tumor, and had lain immediately under the ſkin. I conclude alſo, that this was one of the moſt favourable caſes for operation; for the wound of the artery was ſo wide, the artery was ſo far diſplaced from its proper ſituation, it was ſo ſtretched over the ſurface of the tumor, and ſo flattened by preſſure, betwixt the tumor and the ſkin, that it could be of no uſe in nouriſhing the arm; the arm then was nouriſhed chiefly by its inoſculating branches; and this I am entitled to affirm, from having obſerved, that where there is little blood paſſing in the main trunk of the artery, there is much circulating in the collateral arteries; that wherever the trunk of the artery has been deeply wounded, the pulſe has been proportionably weak before operation, and has returned immediately after the artery was tied. In one caſe only have I ſeen blood run from the lower end of the divided artery; and in that caſe the artery was very nearly divided acroſs *. This is one of the many caſes in which the arm has been very raſhly cut off, and this pricking of the artery, with a wound of its outer coat only, is an imaginary accident.

WE CANNOT REPRESS THE BLOOD OF AN ANEURISM.

2dly, It is not leſs imaginary, that the blood can be puſhed back from the aneuriſmal bag into the artery! there is no ſuch thing, it is a mere deluſion; there is

* The rigidity which (in this caſe of Ruiſch's) was attributed to the aſtringency of the ſpirituous embrocations, was owing merely to the tenſeneſs of the faſcia; for the whole of the bend of the arm was raiſed into a tumor.

one caſe only, viz. the aneuriſmal varix, where this can be done: The aneuriſmal varix is a complicated aneuriſm, where the artery and vein, being both wounded, have not healed apart, but have adhered, a free communication being formed betwixt the artery and vein; the vein is dilated by the pulſations of the artery, the blood is ſtill circulating and fluid; it may be puſhed onwards in the veins, and might be preſſed back into the artery. When this kind of aneuriſm is emptied, the artery is perceptibly felt filling the bag with a diſtinct pulſation, and a ſort of whizzing noiſe; but in the proper aneuriſm no ſuch thing can happen; the blood is firmly coagulated. I never found, in an aneuriſm of ſix weeks ſtanding, any fluid flood! It was all grumous and lumpy; and the clots which obſtruct the mouth of the artery were peculiarly firm. It does not appear to me that the aneuriſm of the arm diſtends regularly and gradually, but like a bleeding artery, it burſts out from time to time with an internal hæmorrhagy.

Aneuriſm is more frequent among the lower ranks, eſpecially among labourers. A poor man having refrained from labour for a week or more, is tempted to begin work again for the ſupport of his family; he works for a day or two, the tumor is perceptibly enlarged after each exertion; the blood is then evacuated into the cellular ſubſtance, by ſucceſſive internal hæmorrhages; till, at the end of ſix weeks, or two months, the arm is quite benumbed by the compreſſion of this accumulating and condenſed blood, and the operation is ſubmitted to; but the blood thus ſucceſſively effuſed is firmly coagulated, and we find the particular clot, which cloſes the ſlit in the artery, as firm as the gizzard of a fowl. I conclude, that we cannot reduce the blood of an aneuriſmal tumor; firſt, Becauſe it is coagulated; ſecondly, Becauſe the wound of the artery is ſlit-like, and acts like a valve; thirdly, Becauſe if we did preſs the blood back into the artery, we ſhould feel the bag in ſome ſlight degree flaccid, and ſhould feel the action of the artery when it filled the tumor again; fourthly, Becauſe I have noticed, that in thoſe very aneuriſms, where many gentlemen in conſultation declared, that, by preſſing long and dexterouſly, they had reduced the ſize of the tumor, upon opening the aneuriſm, I have found the whole contents of the tumor grumous, without one particle of blood in the aneuriſm fluid enough to be returned into the artery, although the opening had been quite favourable to the receiving of it; fifthly, I do not think the pulſe at the wriſt could be ſo firm as we often feel it, unleſs the artery were perfectly cloſed by that particular clot, which plugs up the ſlit; and that again kept firm, by the general preſſure of the

grumous blood behind it. I do not then reckon the returning of the blood into the artery among the ſigns of aneuriſm, whether old or recent; the appearance is a mere deception; every ſurgeon muſt recollect, that by preſſing firmly upon any tumor, he can ſink it into the cellular ſubſtance, and reduce its apparent ſize; and it is particularly eaſy, by preſſure and working, to flatten an anueriſmal tumor; for preſſure drives the blood more widely into the ſurrounding cellular ſubſtance, flattens the tumor for a moment, and ſeems to reduce its ſize; while by working the blood aſide, it really makes room for more extravaſation, and increaſes the ſize of the aneuriſm. Of this I have ſeen ſome very imprudent examples.

## THE WOUND IS CALLOUS AND WILL NOT HEAL.

3dly, It is not leſs imaginary, that ſuch a wound could heal by adheſion, ſo as to preſerve the continuity of the arterial canal; for the arterial coats are, in their nature, hard, unyielding, and callous; a clot is uſually interpoſed betwixt the lips of the wound; the blood runs freely along the canal of the artery, ready to flow through the ſlit upon the ſlighteſt exertion of the arm, or ſlighteſt motion of the clot; and there lies a conſiderable collection of blood betwixt the wound of the artery and any compreſs that we can apply!

And when after the aneuriſm has laſted ſome weeks we perform the operation, and open the tumor its whole length, we find the opening of the artery with inverted edges, if the ſlit be as large as I have generally ſeen it; or, if it be ſmall, it is like a pie-hole; or, as the late Profeſſor Monro deſcribes it, very happily, "it is like a hole ſtruck in a piece of leather with a punch *."

* When the wound of the artery is ſmall, and the aneuriſm is formed; the lips of the wound in the artery heal; it is this which gives the circular appearance to the orifice, which is well deſcribed a hundred years ago by Wiſeman. He relates the caſe of a man whoſe artery was wounded in bleeding. He had applied a laced glove and ſheath for the arm in hopes of leſſening the tumor, and puſhing back the blood into the artery, and he had in ſome degree ſucceeded; but the patient grew weary of theſe methods of cure, and "gave ear to every prattle, and fell into the hands of an empiric, who, while he tried to cure it with herbs, &c. ſo ſoftened the tumor, that he made way for the blood to burſt forth abundantly. The ſurgeons who were firſt called made a ſhift to ſtop the blood; but the arm gangrened; they cut it off. Wiſeman went to ſee it amputated; after amputation they ſlit up the arm, and laid the artery bare; it retained its natural ſhape and ſmallneſs, not one jot dilated; nor was the apercion conſiderable which had

Yet Mr. Lambert of Newcaſtle, notwithſtanding this calloſity of the artery, ventured to expect ſucceſs in ſewing thoſe callous lips together, and he ſucceeded. I performed the ſame operation, and failed; I opened the aneuriſm, hooked out the clots of blood; and then raiſed the artery upon my forefinger; I took next a very fine bleeding lancet, and ſcarified the two lips of the wound; after having made them raw, I paſſed a very delicate glover's needle through both the lips of the wounded artery, and twiſted a fine cambric thread round the needle, ſo as to draw the lips of the wound cloſe. Upon letting go the tourniquet, the artery was ſeen beating in the bottom of the wound; the pulſe in the wriſt became inſtantly as ſtrong as in the other hand; indeed we thought this artery beat rather more powerfully. Every thing went on well till the twelfth day; on that day I was obliged to go out of town; a dangerous hæmorrhagy came on in the evening. On the fourteenth day the bleeding returned; I was ſtill out of town, and the artery was tied with the two ligatures, as uſual, by the late Dr. Aitken. It was inſinuated, that had I been with my own patient, the operation might ſtill have ſucceeded; but I am ſure it failed from natural cauſes, and that whatever faults might be imputed to the late Dr. Aitken, want of enthuſiaſm in his profeſſion was not among the number; I know he would have been delighted to ſee me ſucceed, and he actually aſſiſted me in the operation with a degree of zeal which was very honourable to him.

In reflecting upon this operation, I have ſometimes thought that it muſt have failed, from the needle being ſtruck too deeply into the coats of the artery; that it might have ſucceeded had the needle been ſtruck only into the mere cellular coat which ſurrounds the artery, in which caſe the needle would have come early, and ſafely away. I was, happily for my own eaſe of mind, not aware of the dangerous ſituation of my patient for thoſe fourteen days;—but, now that we are aware of this danger! ſenſible that the patient, if not carefully watched for a fortnight, may die in a moment of time! who will venture to repeat the experiment? Beſides, we are now ſo little apprehenſive of gangrene, from want of circulation, that our motives for repeating this dangerous operation are very ſlight indeed.

been made by that accident, *but, by reaſon of its conſtitution*, continued open, as I have ſeen a hole punched in leather." Wiſeman, page 126.

COMPRESSION OBLITERATES THE CANAL OF THE ARTERY.

4thly, That the old operation of compreſſing the artery did not cure by reuniting the wound, and preſerving the canal of the artery, is to me very clearly proved by the manner in which they atchieved this tedious cure. To ſatisfy you that I argue correctly, I will ſtate to you one of the moſt remarkable and beſt authenticated caſes of this kind, that ſtands upon record. At the very time when all the ſurgeons in Europe had begun to take a particular intereſt in this diſeaſe; while they were ſtill fearful of gangrene, and anxious to have ſome abſolute proof of the diſeaſe being curable by compreſſion, it happened that Bourdelot, phyſician to the Queen of Sweden, was ſtruck in the brachial artery.

" My artery," ſays Bourdelot, " was pricked, in the bend of the arm, where it runs under the median vein, though I had at the time remarked to the ſurgeon the pulſation of the artery, and adviſed him againſt bleeding there. When I ſaw the blood fly, per ſaltim, I applied graduated compreſſes, and kept quiet for ſome time; the outward wound indeed ſoon healed; but in no long ſpace I perceived a ſmall tubercle riſing, which increaſed in ſpite of my endeavours to repreſs it. I now was convinced that ſtyptics could not penetrate the ſkin, for thick compreſſes dipped in ſtyptics had been of no uſe."

" The aneuriſm attained the ſize of a ſmall hen's egg; but I accompliſhed the cure in the courſe of a year by applying a round compreſs, bound firmly down upon the aneuriſm with thongs, which turned round the elbow above and below, and were adapted to any requiſite degree of compreſſion by holes in the ſtraps, which hooked upon ſmall buttons. The ſcutum was preſſed deep down upon the artery, while the blood was allowed to paſs along the veins towards the heart, by the ſides of the compreſs, (in the angles made by the ſtraps of the bandage with the cuſhion). The fretting of the compreſs I obviated by dipping it from time to time in a ſolution of alum in ſalt water."

" There remained not in my arm the ſmalleſt mark of the tumor; but for two years I was ſenſible of a degree of conſtriction round the wound, and along the courſe of the artery; the hardneſs I thought never would have diſappeared, for the artery had acquired a ſolid and tendinous firmneſs; but that alſo was in due time entirely diſcuſſed, not leaving even the mark of a ſcar; and though the

ſhield or compreſs left a ſort of hollow in the bend of the arm; that alſo, in the courſe of a few months, diſappeared. The dilated arteries and veins, which ſupplied the place of the main artery, contracted again *as ſoon as the compreſs was removed, and the blood allowed to flow in its uſual channel* *."

This caſe contains in it every poſſible argument againſt the concluſion which it was meant to eſtabliſh. We may here obſerve, that it is not ſo eaſy as was imagined, to heal the wound in an artery even in the moſt favourable circumſtances; for Bourdelot, the moment his artery was wounded, was fully ſenſible of what had happened to him; he inſtantly applied his compreſs and bandage, with all the precaution which an intereſt in his own ſituation, and the fear of a diſeaſe, much dreaded in thoſe days, could ſuggeſt: There would, I dare ſay, be no ſlackneſs there! nor any want of attention to the ſtate of the bandage! yet he could not oppoſe the artery, he could not heal this wound even when it was recent, the lips juſt divided, and the parts not yet injected with blood!

But perhaps after having got the proper bandage made, he may have prevailed ſo far as to heal the artery? This I think ſtill leſs probable; for when he began to apply the proper bandage, the aneuriſm was fully formed, and a week, or rather a fortnight, had elapſed from the time of the wound, before he applied his ſcutum or compreſs, ſo that the lips of the wounded artery muſt have become

* "Inciſa mihi fuit arteria in flexura brachii dextri, qua ſub vena mediana decurrit, quanquam a me monitus fuiſſet Chirurgus ibi loci pulſare arteriam; Ubi animadverti ſanguinem ea ejaculari ad ſingulas pulſationes, plurima ſplenia adponi curavi, ac longa quiete uſus ſum; cutis prompte coaluit, ac cicatrix exterior cito genita eſt, interim ad aliquod temporis ſpatium tuberculum quoddam eminebat, quod paulatim incrementum habuit, irritis quibuſque remediis."

"Denſiſſima ſplenia, aquis ſtypticis imbuta, opem nullam afferebant, cujus rei ratio paulo poſt mihi innotuit; aquæ vis quinque integumenta pervadere nequit.

"Id quo affectus fui magnitudinem attigit ovi junioris gallinæ, Curationem obtinui intra anni ſpatium, tumor in dies minuebatur, adplicato ſcuto rotundo, cuius lora non procul a cubito, ſupra et infra ducta cohibebantur ope fibulæ clavi: Lora prædicta, exiguis foraminibus pertuſa, ad conſtrictionis vel relaxationis facilitatem, vacuum ſpatium concedebant redeunti ſanguini, ad cor emiſſo per venas, tanquam infra ponticulum: Scutum profunde arteriam contingebat, paucam ſuperficiem occupans, exiguumque pruritum inducens, cui obviam ibam ſcutum immergendo aquæ ſale imbutæ, in qua alumen uſtum diſſolutum fuerat."

"Brachium, qua parte tumor enatus fuerat, nulla illius gerit in me veſtigia: Duorum annorum ſpatio in arteriæ totius corpore ſuperſtes, fuit ſenſus, circa vulneris locum, quaſi conſtrictionis a ſpira, et cicatricis: *Duritiem nunquam ceſſuram credidi, arteria enim ſubſtantiam obtinet nerveam et ſolidam, attamen diſſipatio omnimoda conſequuta eſt, ne ſuperſtite quidem cicatrice;* In flexura brachii a ſcuto efficta erat fovea, at intra trium aut quatuor menſium ſpatium oppleta illa fuit, exiſtimo arteriolas et venulas humeri, quæ vices ſupplebant

callous; beſides a tumor as large as a pullet's egg was then interpoſed betwixt his compreſs and the artery; "he ſuppoſes the blood to be gradually preſſed back from the bag into the artery, the bag yielding before the compreſs like a ſponge, and emptying its blood into the artery *." Even granting this hypotheſis, we muſt preſume a long time to have elapſed before the edges of this wounded artery could have come into contact; by which time they muſt have healed apart! and have been paſt all chance or poſſibility of adhering together.

Since then his machine could not reunite the artery, and yet did actually cure the aneuriſm; the next important queſtion is, How and by what natural proceſs was the cure atchieved? Let it be obſerved, that this tumor was many months of diſappearing, or even of leſſening. That an aneuriſm is one of the moſt firm and ſolid of all tumors, being hard crammed with coagulated blood. Such tumor then is preſſed againſt the artery, the artery is flattened betwixt the tumor and the bone, the circulation in the main channel is interrupted, and the collateral channels are enlarged till they become able to ſupport the arm, and ſupply it with blood; when theſe leſſer arteries are ſo enlarged, and rendered active, as to work the blood forwards, it not only forſakes the main trunk, but has a tendency to continue in this new rout! The main artery is forſaken of the blood, its ſides are kept in cloſe contact, they adhere to each other, and the artery becomes like the hypogaſtric arteries or umbilical vein, a firm cord †.

arteriæ læſæ, de qua verba feci, et in amplitudinem diductæ erant, coarctatus fuiſſe et in nihilum redactas, conceſſo meatu ſanguini arterioſo per canalem ſolitum, inſigni arteriæ trunco aperto manente et libero."

* "Si qui a me quæſierit, quo tandem abit id tegmen ſeu contextus, ſanguinem aneuriſmatis continens, ſi quando hoc omnino ſanari contigerit, ac pars ad eundem omnino ſtatum redierit quem obtinebat ante inflictum vulnus? Reſpondeo id evaneſcere, tanquam ſpongiam ut compreſſionis a ſcuto factæ, id quod inde exprimitur influere in arterias."

† In reporting the facts concerning this caſe, in which all Europe was at that time intereſted, and which was indeed the precedent for many very dangerous inventions of ſpring bandages, and other compreſſing machines, I take my report altogether from the original letter to Bligni, the Foart Limmous of thoſe days. This I take to be the true ſtory. I will hardly condeſcend to take notice of the trifling conceits which came into the heads of other ſurgeons concerning this bandage, and its mode of operation. Bourdelot himſelf ſays not one word about this compreſs being in the form of a bridge; if he ſpeaks of the blood paſſing freely along the veins, while the artery ſingly was compreſſed, he aſcribes this not to the peculiar form of his ſcutum, ſhield, or compreſs, but merely to that interſtice which was neceſſarily left betwixt a high towering compreſs, placed upon the top of an aneuriſm, and the ſtraps which buckled round the arm, and which went over this towering compreſs. Yet Dionis (who I ſuſpect could not read Bourdelot's letter becauſe it was not in French), calls his compreſſing inſtrument "Ponton," "a Bridge compreſs." He

This is truly the operation which they performed with their compreſſes. We have every proof we could deſire of the proceſs being complete in this caſe; for we find Mr. Bourdelot remarking, that the artery in his arm had acquired a degree of ſolid and tendinous hardneſs, never to be diſcuſſed, as he believed; " Duritiem nunquam ceſſuram credidi; arteria enim ſubſtantiam obtineat nerveam et ſolidam," &c.

I am perſuaded theſe old phyſicians accompliſhed with their compreſs exactly the ſame operation that we perform with the needle; they obliterated the canal of the artery; and, had they underſtood the pathology of this diſeaſe, or the effect of their own operations, they would have been able, I am perſuaded, to have deſcribed to us the period of coldneſs and of interrupted pulſe, and the manner of its return, juſt as diſtinctly in their operation by compreſſion as in ours by inciſion; and certainly, had they ſucceeded as they imagined they did, viz. by diſcuſſing the tumor and healing the wounded artery, they would have told us, in place of this duritiem nerveam et ſolidam, how the pulſe was felt in the bending of the arm as diſtinctly after the cure as before the artery was wounded. They would have compreſſed the artery only till they had obliterated it; and then have left the abſorption to nature; but would not ſurely have continued this ſevere bandage for years *.

## PELLETS OF CHEWED PAPER APPLIED TO THE OPEN ARTERY DO NOT HEAL BUT OBLITERATE IT.

5thly, When long ago every ſurgeon was in the practice, after opening the aneuriſm, of cloſing the wound in the artery with a pellet of chewed paper, is it likely

deſcribes the compreſs as having a groove in it, which, while the reſt of the compreſs had its full effect upon the tumor, allowed the blood to paſs along the artery in this groove as the waters of a river do under a bridge. " Quoyque cet écuſſon ſoit fait pour comprimer la tumeur, il y a une canelure pour laiſſer la liberté au ſang de l'artére de paſſer par deſſous. C'eſt ce qui luy a fait donner le nom de ponton, étant ſemblable à un pont qui n'empêche pas l'eau d'une riviere de continuer ſon cours: il le porta l'eſpace d'une année, et la tumeur diminuant tous les jours il ſe trouva gueri entierement."

* We cannot help being ſurpriſed to find even the celebrated Deſſault, after having cured a little girl of aneuriſm by compreſſion, ſay not one word about the obliteration of the artery, nor yet mention its remaining pervious, a fact which he might have eaſily aſcertained; for the girl was ſix years old at the time of the artery being wounded with the lancet; ſhe wore the compreſſing bandage for a year! and ſhe was fifteen years old at the time of writing the caſe!"—Vid. Journal de Chirurgie, page 37. Vol. II.

that the lips of the wounded artery were made to adhere? Having myſelf failed in reuniting the lips of a wounded artery, I am very little inclined to believe that a rude pellet of chewed paper, graduated compreſſes, and a firm bandage over all, could do any thing but obliterate the canal of the artery. We do indeed find Garengeot deſcribing, with all imaginable confidence, the appearance of the artery at the point where the wound of it was healed up by the chewed paper; but I believe he was juſt making that experiment on the credulity of his reader, which coſt him leſs, perhaps, than moſt other authors. He wiſhed to ſay to his reader, "You will, as ſoon as the compreſs falls off, ſee diſtinctly the cicatrix of the united artery!" but, with all his effrontery, he could not bring himſelf to this. He ſays only, "As ſoon as the lint and the pellet of chewed paper fall off from the artery, you will remark a white ſpace where the beating of the artery is more intenſe! that is, the very place where the wound was, and you muſt not leave it uncovered for a moment, but put a large compreſs upon it, powdered with roſin and whatever elſe may promote the generation of fleſh round the artery †."

Garengeot is an author in whom we can have no confidence; we find him writing by mere conjecture about many intereſting points of pathology; but there is a more reſpectable author, Mr. Morrand, who alſo believed that he cured arteries by compreſſion. He was in the practice of opening the aneuriſm, and of putting down a piece of ſponge or agaric upon the wounded part of the artery, heaping compreſſes above the agaric, and binding the whole very firm with rollers. Speaking of one particular caſe, he ſays, that he cured an artery wounded with the lancet in a manner very different from that where the ligature is uſed. "I need not, ſays Mr. Morrand, mention the ſeveral precautions which I took after applying Mr. Broſſard's agaric to the artery." I ſhall only obſerve, that the pulſe, which was interrupted for twenty hours, returned at the end of that time, and that I cicatrized the wound in a month." "Je dirai ſeulement que le poulx intercepté a la main pendant environ vingt heures, ſe manifeſta au bout de ce temps la, &c. p. 168.

All thoſe ſurgeons who have uſed the compreſs, ſponge, or agaric, believed

† "Quant la charpie eſt tombée et le petit morceau de papier mâché, on apperçoit à l'artére un endroit blanchâtre où le battement paroît plus ſenſible: c'eſt-là l'endroit où étoit la diviſion, qu'il ne faut pas laiſſer long-tems découvert, mais appliquer promtement deſſus un bourdonnet aſſez gros, ſau-poudré de poudre de thérebentine ſéche, &c. afin de faire venir de bonnes chairs bien ſolides autour de l'artére, et le reſte de l'appareil comme je viens de le dire."

that they healed the wound of the artery; but you, I dare say, have a more correct idea of what Mr. Morrand was doing with his puff-ball, and what this interruption of the pulse means. He had entirely compressed the artery, laid its sides in contact, and obliterated its canal; the pulse was for twenty-four hours interrupted, the collateral arteries were enlarged, the pulse returned; the operation, in short, was essentially the same with that of tying the artery *. This gentleman, whose artery Mr. Morrand thought he had healed by pressing a piece of agaric upon it, had the artery wounded with a sword, a kind of wound which should not be easily cured by the reunion of its lips. But we find in Morrand's paper a still more decisive fact than this: He had cured two others of aneurisms in the arm by applying a bit of agaric to the wounded artery; and in those two cases the pulse did not return in one till the fifteenth, nor in the other till the seventeenth day." An artery completely flattened and compressed for seventeen days! certainly was not healed but obliterated.

So little did these old surgeons understand the effect of their compresses, that they imagined that their success depended much upon the astringency of the liquor in which the compresses were dipped, and their astringent liquor was usually a diluted caustic! Webber applied butter of antimony to the wound of

* We find, in the following transcript from Murray, two very singular things: In the first place, We find two patients allowed to die of bleeding, during the night, after some awkward attempt by the surgeons of the hospital at curing the aneurism of the arm, in which, according to the oldest fashion, they had tried compression not above the skin, with the hopes of saving their patients from the pains and horror of a bloody operation; but had first cut up the aneurismal tumor, and then, instead of tying the artery with a ligature, had applied a compress, and applied it so insecurely, that both the patients, from some unwary motion in sleep, had bled to death during the night. This is his fact; and his opinion, as it is plainly implied in the following words, is very curious. "If your compression be too powerful, in place of saving the artery, you will absolutely obliterate the artery; but if you compress lightly with design of saving the artery, you are never out of danger of an alarming, or even fatal hæmorrhagy." This language very clearly implies, that Murray, like most others, expects from compression, not an obliteration of the artery, but thinks, as Heister did long ago, and Mr. Morrand more lately (Vid. Acad. des Sciences, Vol. V. p. 172, Octavo.) that the compress, by suppressing the quick motion of the artery, heals the wound.

Murray speaks thus: "Frustra itaque, si firmam compressionem instituimus, conservationem arteriæ expectamus, in leviore autem, qualis ad scopum obtinendum requiritur, hæmorrhagiæ repetitæ quæ chirurgi animum quam maxime sollicitant, atque etiam ægrum ad ultimam sæpe metam detrudunt, vix evitari possunt, leviori sub somno, motu brachii, quo compresio aliquantum fuit perturbata, binos ægros Montispessulani vigesimo post operationem die, hæmorrhagia exitiali correptos fuisse, narravit cel. Præses. (viz. Murray.")—Vid. Arvidson Murray, p. 20.

the artery in aneuriſm of the arm; and Garengeot truſted not ſo much to his compreſs of chewed paper as to the liquor he dipped it in, which was not a mere aſtringent, it was a cauſtic, and a quackiſh one, which he had the meanneſs to conceal, (" Pour cet effet les operatéurs d'aujourd'hui ſe *ſervent du cauſtique*, ou de la ligature. Si l'on prend le parti du cauſtique, voici la pratique la mieux reçue. D'abord que l'ouverture de l'artére eſt bien découverte, je prens un morceau de papier brouillard mâché et exprimé; je le trempe enſuite dans *un cauſtique liquide, que je préfere à tous les autres cauſtiques*, je l'exprime fortement de peur, &c." Garengeot, p. 246.) And Aſman plainly recommends buttons of vitriol to be applied to the wound in the artery. (" Imponantur vulneri Globuli piſi magnitudinis ex vitriolo Cyprino ad albedinem Calcinato Goſſyppio probe involuti." " Globulos vulneri arteriæ proximos tamdiu relinquendos eſſe donec ſponte decidant.") Thus we perceive, not only that naked buttons of vitriol were applied to the wound of the artery, but kept there till they produced ſloughs. What could actual cauſtics like theſe do but obliterate the artery by inflammation, or deſtroy it?

## AT THE MOMENT OF THE WOUND THE ARTERY MAY BE HEALED.

6thly, There is juſt one moment of time * in which it is poſſible to ſucceed in reuniting a wounded artery, and it is the very caſe in which Bourdelot failed. In a recent wound, where the ſurgeon is ſenſible of the artery being wounded, it is poſſible to heal the artery before the aneuriſm is formed, before any tumor of blood is interpoſed betwixt the compreſs and the artery, before the cellular ſubſtance is crammed with blood, or ſeparated from that artery which it ſhould ſupport and aſſiſt in its adheſion. That an artery in the moment of being wounded may be made to reunite, I hold to be an abſolute fact, not becauſe it is proved by the authority of thoſe who have prevented aneuriſms by a ſkilful compreſs; for in ſuch caſes, the aneuriſm being prevented,

* For the purpoſe of compreſſing a wounded artery, the older ſurgeons uſually put into the folds of their firſt compreſs, a piece of money, a ſplit bean with the convex ſide towards the artery, a peach ſtone, the half of a walnut ſhell, &c.

we ſtill are left in doubt whether the artery was actually wounded! but the aneuriſmal varix aſcertains the fact.

The Aneuriſmal Varix is a diſeaſe produced after bleeding with the lancet, by the cloſe union of the wound of the artery with the wound of the vein, and the blood of the vein ruſhing into the artery through this ſide paſſage diſtends it. I would trace, in the following order, the ſeveral forms which a wounded artery aſſumes.——Firſt, It generally happens, after any accident of this kind, that the compreſſion which the ſurgeon makes, while it prevents the outward bleeding, is not ſufficient entirely to ſubdue the action of the artery, which bleeds inwardly! the blood is then poured out under the faſcia! the holes or lancet wounds in both ſides of the vein, (through which the artery was ſtruck), heal! the blood is extravaſated under the faſcia, and the faſcia, by its great ſtrength and tenſion, reſiſts the effuſion, ſo that it takes place very ſlowly: It is thus, that, in about a month or ſix weeks, the common aneuriſm of the arm is formed, having for its external coat the thick faſcia of the biceps muſcle.

Secondly, It ſometimes happens, that the preſſure made by the ſurgeon at the time of the accident, is ſo ſteady as to produce an adheſion of the wounded lips of the artery with the wound of the faſcia; then the diſeaſe does not appear in its proper form; there is no reſiſtance from the faſcia; the artery does not eject its blood ſlowly into the cellular ſubſtance under the faſcia, but drives it freely under the common cellular ſubſtance of the ſkin; the regular form of the diſeaſe, the circumſcribed tumour, is wanting, and the whole arm from the ſhoulder to the wriſt is black with extravaſated blood as if mortified.

Thirdly, It often happens, that the preſſure is ſtill more correct, ſteady, and well ſupported, and the vein on the outſide of the faſcia is kept in cloſe contact with the faſcia; while the wounded artery within the faſcia is kept in cloſe contact with its inner ſurface! the artery unites with the inner ſurface of the faſcia, the vein unites with its external ſurface; and a lateral communication being thus eſtabliſhed betwixt the artery and vein, the vein is dilated by the force of the artery into a varix; which, from the nature of its connection with the artery, is named ANEURISMAL VARIX. In this diſeaſe the blood paſſes ſo eaſily into the vein, that little blood goes downwards along the artery; the arm below is impoveriſhed of blood, and is greatly weakened; the dilatation of the vein increaſes almoſt to burſting; and as the vein and artery, though they run parallel, are not in contact with each other, but are ſeparated by the ſheet of tendon

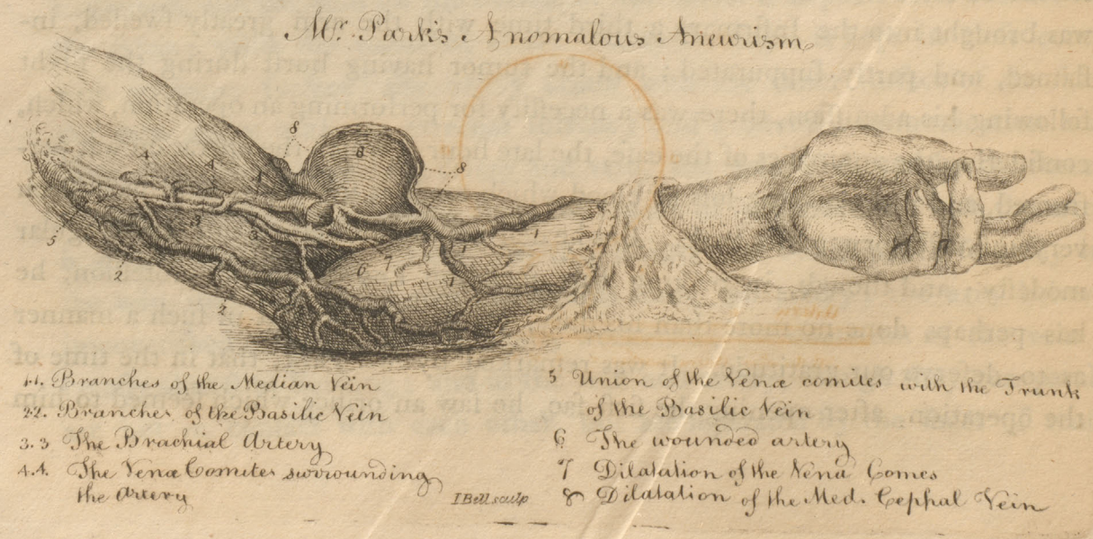
named the Faſcia, the communication betwixt the vein and artery comes to be of conſiderable length! by emptying the dilated vein, and pinching with your fingers and thumb, you can diſtinctly feel the communication betwixt them.

Fourthly, The artery where it lies within the faſcia is ſurrounded with a ſet of ſmall concomitant veins, which, from their encircling the artery, are named Venæ Comites, or Satellites; theſe alſo are ſometimes ſtruck with the lancet; and, by continued preſſure, the artery! the internal vein! the faſcia! and the external vein! are all maſſed together with a conſiderable degree of confuſion, and thickening of parts. But however confuſed the other appearances may be in ſuch a caſe, this circumſtance will diſtinctly mark the nature of the diſeaſe; that in performing the operation (as there are two veins and one artery united by adheſion,) the ſurgeon will find two ſucceſſive ſacs of blood, one under the other, with a ſmall orifice of communication betwixt them. Perhaps the anomalous caſe related by Mr. Park of Liverpool was of this nature?

The young man, whoſe caſe Mr. Park deſcribes, had been coarſely bled, was ſenſible at the time of being ſtruck too deep in the arm, and felt more than ordinary pain. He preſented himſelf three times ſucceſſively at the Liverpool Infirmary. Even at the firſt this was marked as an anomalous diſeaſe; for there was a complication, as if of common aneuriſm with aneuriſmal varix. There lay immediately over the wounded artery, and receiving its pulſation, a ſmall hard circumſcribed tumor, no bigger than a walnut; and there accompanied this ſmaller tumor, a conſiderable aneuriſmal dilatation of the Baſilic vein. He called a ſecond time at the Hoſpital, and ſtill the aneuriſmal tumor over the artery held itſelf diſtinct from the varicoſe dilatation of the vein. It was about a year after the diſeaſe began, that, having uſed too great freedoms with his arm, he was brought into the Infirmary a third time with the arm greatly ſwelled, inflamed, and partly ſuppurated; and the tumor having burſt during the night following his admiſſion, there was a neceſſity for performing an operation, which, conſidering the anomalies of the caſe, the late hour at which the operation was performed, and that alarming loſs of blood which made it neceſſary, muſt have been very unſatisfactory to Mr. Park. But he delivers this intereſting caſe with ſingular modeſty; and though, in making this operation known to the profeſſion, he has perhaps done no more than his duty, yet he has done it in ſuch a manner as to deſerve our gratitude. It was remarked by Mr. Park, that in the time of the operation, after opening the firſt ſac, he ſaw an orifice which ſeemed to him

to be the orifice of the artery; but he found, upon introducing the probe, that it could not paſs upwards nor downwards farther than half an inch. Upon opening this ſecond ſac, he found at the back of it a ſecond opening, a ſmall, round, circumſcribed orifice, which led into the artery. The artery thus diſcovered was tied accordingly, and the operation finiſhed.

In this caſe one of two things muſt have happened! The artery, the Vena Comes, the faſcia, and the outward vein, muſt have all united together, being maſſed and thickened by inflammation; the ready communication of the Vena Comes with the outward vein, may have ſaved the Vena Comes from dilatation; and the circumſtance of the faſcia covering the dilated part of the internal vein, (and adhering to it), may have given it peculiar firmneſs, and may account for the internal tumor being ſo ſmall, (it was no bigger than a walnut); and farther, the frequent valves in this Vena Comes, or internal vein, may account for the limited dilatation of it, and for the probe not paſſing eaſily upwards or downwards. Or, on the other hand, the artery may have begun to form a proper aneuriſm among the cellular ſubſtance; the paſſage betwixt the faſcia and the vein may have continued open; the blood may have made its way from the ſac of this incipient aneuriſm into the vein; and, if ſo, the blood being thus conveyed away through the vein, the force would be taken off from the proper aneuriſmal ſac, the cellular ſubſtance would be condenſed into the form of a regular bag, that bag would be ſaved from further diſtention by its free communication with the vein, and the perpetual circulation of freſh blood, through it, would prevent the formation of clots, and would alſo prevent the tumor aſſuming the proper form of aneuriſm.

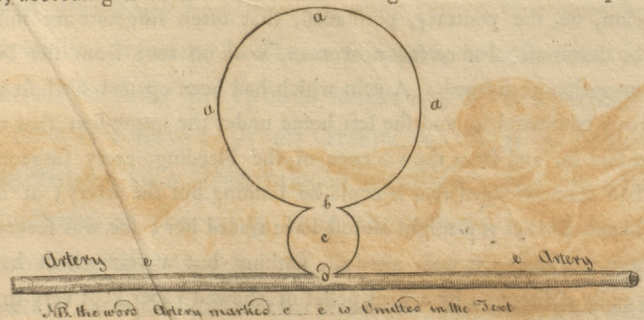


Now, theſe various adheſions ſufficiently prove to me, that an artery may be healed; for if an artery can thus be made to adhere to the Faſcia and vein, ſo as to form an aneuriſmal varix, it may, by a firmer and ſteadier degree of compreſſion, have its wounded lips reunited; and this ſeems to be the more probable, when we conſider how theſe lips of the wounded artery are imbedded in cellular ſubſtance, actually wounded along with the artery, and ready at all times to ſwell and cloſe the wound.

Thus, though I do not believe that an aneuriſm, perfectly formed ever has been cured otherwiſe than by a total obliteration of that artery which produced it; * yet am I well ſatisfied, that after a recent wound with the lancet the generation of aneuriſm has been often prevented. The celebrated Brambilla recommends, as the ſureſt of all compreſſes for immediately healing a wounded artery and preventing aneuriſm, the pellet of chewed paper, ſupported with graduated compreſſes and a firm bandage. The cure which Brambilla performs thus, is not like thoſe of Bourdelot and Morrand, an obliteration of the canal of an artery, whoſe lips are become too callous to be reunited! but the reunion of an artery recently wounded, the wound of the artery itſelf freſh and raw, and the ſurrounding cellular ſubſtance alſo wounded and inflamed; not an obliteration by compreſſion, gradually increaſed for the ſpace of a year, but an

* In the following Chapter, ſome further views of this ſubject, as they relate to Natural Aneuriſm, will be explained.

Mr. Park gives the following plan of his own operation, and from it I have ventured to make the conjecture which I have delivered above. A ſection of thoſe cyſts, ſays Mr. Park, would exhibit ſome ſuch appearance as this, (a a) The firſt or outer cyſt; (b) The orifice leading into the ſecond or deeper cyſt; (c) at the bottom of which was ſeen the orifice (d) leading into marked (e e). I have made my plan, at the foot of laſt page, according to the relation which I imagine muſt have taken place among the wounded veſſels.




N.B. the word Artery marked e e is omitted in the Text

immediate reunion, procured by the neat appoſition and ſteady ſupport of the wounded parts, continued for no longer than eight days *.

It is an anecdote in ſurgery, not unworthy of being related, That this wound of the artery is as frequent in Germany now as it was in France in thoſe days when Dionis practiſed, and when the ſurgeons were, by law, obliged to penſion thoſe whoſe arms they had injured in bleeding. " In Germany, ſays a great ſurgical writer, the phlegm has acquired a great reputation," but the harm it has done, while it has been acquiring reputation, is incalculable ; for Brambilla ſays, " I have frequently been preſent when the young ſurgeon, having ſtruck a vein with the Fleam, (Vena Phlebotomo elaſtico inciſa), has been unable to ſtop the bleeding; the young man being himſelf ignorant, ſays Brambilla, of having wounded the artery, I have, to prevent alarm, tied up the arm myſelf. Upon leaving the houſe, I have aſked the young man whether he was ſenſible of having wounded the artery ? when ſuddenly, recollecting the deciſive ſigns of a wounded artery, he has nearly fainted at the thought †."

Brambilla adds, that innumerable accidents of this kind prove that wounds of the artery, eſpecially in bleeding, may be eaſily healed ‡.

* Vulnere hac ratione deligato, membrum, per octo decemve dies, flexum quietumque tenendum eſt, quibus preterlapſis quod ſi faſcia ſolvatur, arteriæ vulnus plerumque glutinatum deprehenditur. Brambilla, page 93.

† Contigit aliquando, ut me præſente juvenis chirurgus, vena phlebotomo elaſtico inciſa, ſanguinie cohibendo haud ſufficeret, ut pote neſcius arteriam læſum eſſe. Quin ægra rationem inſpiceret aut aliquid auſpicaretur, ipſemet ego deligationem modo ſuperius expoſito adminiſtravi, totamque curam perfeci. Cum vero egrediremur interrogavi juvenem illum chirurgum, nonne arteriæ vulnus inflictum eſſe animadverterit ? at ille phænomenorum, ſub operation conſpicuorum, nunc ſubito reminiſcens, tanto terrore percellebatur, ut parum abſuerit, quin animo, deficiſſet." Page 92.

‡ I am far from thinking that every caſe thus bandaged by the ſurgeon, and thus cured, has been a wounded artery. I am, on the contrary, perſuaded, that often ſurgeons are miſtaken, though, ſurely, Brambilla could not be deceived. I once ſaw a woman, walk on foot from the North of Scotland, 300 miles, to have ſome operation performed. A vein which had been opened bled ſo violently, that even the tourniquet could ſcarcely command it, and ſhe left home under the impreſſion that the artery was wounded ; her own ſurgeon ſaid ſo, and from the violence of the bleeding, every ſurgeon who had ſeen her in her way up to town had acknowledged that it could be nothing but the artery ; at the end of every day's journey ſhe had loſt blood, ſo that you might almoſt have traced her ; ſhe was ſeveral times obliged to ſtop a day or two from mere weakneſs ; it was, after all, nothing but a vein which had ulcerated and would not heal ; but it was eaſily obliterated by a firm pellet of chewed paper kept very firm for a few days.

## OF THE CONDITION OF AN ARTERY WHEN TIED WITH LIGATURES.

Theſe are my notions of the condition of a wounded artery; and we ſhall proceed next to inveſtigate the ſtate of the artery when actually tied with a ligature. This, far from being an idle ſpeculation, is, I truſt, an inquiry which will lead to very important concluſions; for we naturally inquire, firſt, How the artery, (when tied as in the operation of aneuriſm), is affected by the two ligatures which are put round it? ſecondly, How the open artery of a ſtump is affected by the ſingle ligature with which it is tied? and this leads directly to a very intereſting inquiry, viz. How the accidental burſting of arteries is to be prevented, and from what cauſes ſecondary hæmorrhages ariſe?

An artery is part of the living ſyſtem; it is, indeed, neither ſenſible, ſo as to convey, when injured, the ſenſation of pain, nor is it irritable, ſo as to contract like a muſcle upon the application of ordinary ſtimuli from without; yet is it not the leſs a part of the living ſyſtem, apt, when injured, to enter into a proportioned reaction. An artery has its vaſa vaſorum, its arteries, veins, and lymphatics, for the growth, ſupport, and nouriſhment of its own coats. Its circulation and nouriſhment is according to the common laws of the ſyſtem; and having this apparatus of active veſſels, it is connected with the ſurrounding parts by the common cellular ſubſtance, by leſſer arteries and veins, and the diviſion of that cellular ſubſtance, or of the artery itſelf, is as much a wound, as an inciſion in the ſkin is! By what laws then ſhould we calculate the effect of ligatures on arteries? or by what analogies ſhould we explain them, but by ſimilar operations upon other parts of the body?

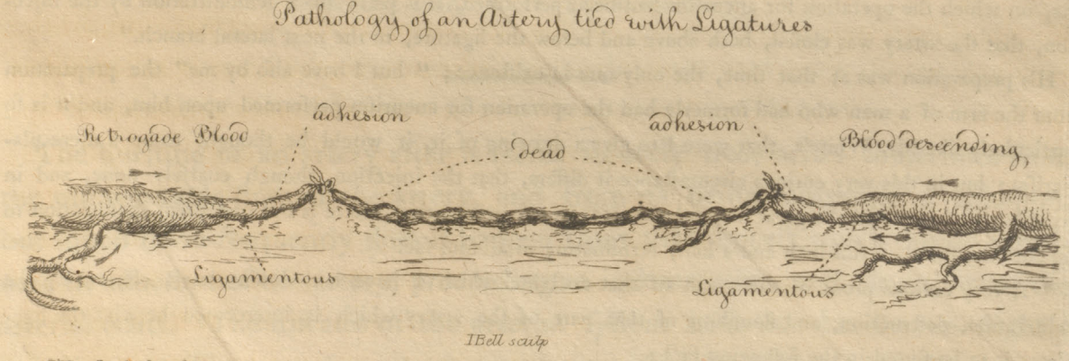
An artery tied with a ligature is like a polypus, whoſe root is tied by a ligature; the circulation in ſuch polypus is interrupted, it ſhrinks, dies, and drops off in the courſe of a few days: Or an artery, as it is a hollow tube, may be more correctly reſembled to a ſtrangulated inteſtine; for the inteſtine is ſo compreſſed by the ſtricture of the ring, that the whole inteſtine is inflamed, the middle portion mortifies and ſloughs off, while the two extremities where the inteſtine is immediately compreſſed by the ſtricture, inflame, and adhere to the ring; and the hollow part of the inteſtinal tube would alſo be obliterated, but for the perpetual paſſage of fæces and flatus, and becauſe there is not, as in the arterial

ſyſtem, any lateral paſſage by which the circulation of fæces through the reſt of the inteſtinal canal could go on.

In performing the operation for aneuriſm of the arm, we uſually apply two ligatures upon the artery, which include betwixt them about two inches of its length; one ligature is applied above the point where the artery is wounded, and one below; and both theſe ligatures come eaſily away on the fourth day, without our needing to cut the ring of the ligatures where they encircle the artery. How is it that theſe ligatures come ſo eaſily away? How do they come away thus without the loop or ring of either of the ligatures being cut open? What becomes of the intercepted portion of the artery? What is the condition of theſe two points of the artery which were embraced by the ligatures? Surely it happens here, as in all other caſes in which we apply a ligature, that the part affected by that ligature is necroſed, mortified, cut off from the ſyſtem. In this operation of tying an aneuriſmal artery, firſt, the pulſe ceaſes the moment the ligatures are drawn, a ſign ſurely that the ſides of the artery are fairly compreſſed againſt one another; ſecondly, The ſpace of the artery (two inches perhaps in length) is ſo fairly intercepted by the two ligatures, that not only does the blood ceaſe to paſs along the canal of the artery, but the circulation in the vaſa vaſorum, in the nouriſhing veſſels of the artery itſelf, ceaſes!—the intercepted piece is killed juſt as a polypus is by a ligature!—The death of this intercepted piece prevents its ſupporting and continuing its connection with the ſurrounding cellular ſubſtance, whence it happens, that of the arterial canal all that is intercepted between the ligatures dies; the cellular ſubſtance ſurrounding that portion of the artery ſuppurates, and the intercepted portion of the artery is as fairly cut out, as if it had been diſſected away with the knife!—and as a polypus, when tied in a nooſe, fades on the ſecond, and drops away on the third or fourth day, in like manner an artery, after being thus tied, decays, mixes with the purulent matter of the wound, and the ligatures become ſlack on the ſecond, and may be drawn away on the fourth or fifth day. The two ends of the artery are meanwhile obliterated by adheſion of their oppoſite ſurfaces, ſo that before the ligatures ſlacken, this adheſion is ſtrong enough to reſiſt the impulſe of the blood, and indeed if it were not for this part of the proceſs, hæmorrhagy muſt always enſue whenever the ligatures were withdrawn. Mr. Petit, in ſupport of his own doctrine, ventures to ſay, "that the ligature is inſecure, becauſe, if the ligature falls off before the clots become firm, the artery will bleed." But this premature falling off of the ligature,

which he apprehended cannot happen! the ligature will not even ſlacken before it have effectually done its buſineſs; or, in other words, one part of the artery will never be mortified and ſeparated until the part above and below have been obliterated by adheſion, in conſequence of the immediate preſſure of the ligatures.

This proceſs then may be explained in few words *. The ligatures applied round an artery operate by making the ſeveral points of the arterial canal paſs through the ſeveral ſtages of inflammation, from adheſion in one point, to gangrene in another. The ſpace included betwixt the ligatures falls into gangrene, the ſpace immediately under the ſtricture of each ligature adheres; this adheſion prevents the gangrene or the inflammation paſſing along the higher parts of the arterial canal; but the inflammation affects the arterial tube a little way upwards and downwards, ſo as to thicken its walls and contract its cavity, whence the canal of the artery is obliterated a little way beyond the exact place where it is tied. All this is proved by the reports of thoſe very ſurgeons who continued theorizing about the contraction, and ſtraitening of the artery, after they were ſenſible that the internal ſurfaces of the artery adhered †.




† We find the following account of this proceſs in Kirkland, p. 5. "An aneuriſm of the arm, being in great danger of burſting, obliged me to perform the operation: The impulſe of the blood againſt the ligature, at the time of the operation, was very great; and as a part of the artery (whoſe diameter was conſiderably enlarged) was expoſed, its pulſations were viſible; but upon removing the dreſſings the third day afterwards, the pulſation could neither be ſeen, nor felt nearer to the ligature than an inch and a half; whence I was led to conclude, that the artery had *collapſed* and *gradually cloſed* itſelf up, to the neareſt lateral branches."

I have obſerved after I had performed the operation for aneuriſm, that on the third day, no pulſe was to be felt at all in the wound; but I never conſidered this as in the leaſt wonderful, ſeeing how very probable it is, that by that time, the ligature muſt have cut acroſs the artery, the artery muſt have ſhrunk, and its canal muſt be obliterated conſiderably beyond the place to which it has ſhrunk. But there is alſo another

That arteries never bleed from the flat ſurface of an amputated ſtump, is ſtill a more deciſive proof of this doctrine; we pull out thoſe arteries with the tenaculum or forceps, tie them with a ſmall thread, and pull that thread away by the third or fourth day; no one will ſuppoſe that when the ligature is drawn away, ſuch artery is prevented from bleeding by a clot ſtopping the mouth of the artery, as Mr. Petit imagined; nor that the canal of the artery is compreſſed by the inflammation and thickening of the ſurrounding cellular ſubſtance, as alleged by Mr. Pouteau; for we draw out the artery and tie it quite clear of any cellular ſubſtance, or muſcle, or adjacent nerve. The artery when tied thus, can be obliterated only by the adheſion of its internal ſurfaces! the part directly under the compreſſion of the ligature unites by adheſion; the part below the ligature is deſtroyed like a polypus, fades and dies; and it is the fading of the lower part thus mortified, that allows the nooſe of the ligature to ſlip off on the third or fourth day *.

thing particular that Mr. Kirkland and Mr. White inſinuate upon all occaſions, that the artery is obliterated juſt up to the firſt inoſculating branch, and always up to it. Mr. White ſays,—" In the arm I have by me, on which the operation for aneuriſm had been performed, it is plain to a demonſtration by the injection, that the artery was cloſed, both above and below the ligature, to the next lateral branch."

His preparation was at that time, the only one in exiſtence; " but I have alſo by me" the preparation from the arm of a man who had formerly had the operation for aneuriſm performed upon him, and it is ſo particularly like Mr. White's, that were I to give a drawing of it, it would be thought to be a mere plagiariſm; but in this very curious circumſtance it differs, that the injection, though coarſely done, and in great hurry, has paſſed the great inoſculation (for in my preparation, there is but one great inoſculation to ſupport the limb), a full inch and a half, terminating in a blind ſac.

* A very curious proof of the truth of that doctrine which I have laid down above, concerning the obliteration, deſtruction, and ſloughing of that part of the artery which is intercepted betwixt the ligatures, is to be found in the following fact:

The celebrated Guattani having operated upon a popliteal aneuriſm, gives this account of the deſtruction of the ſac itſelf. It was a Natural Aneuriſm; the artery was dilated into a fair circumſcribed tumor about the ſize of a gooſe's egg; he tied the artery with two ligatures, one above and one below this tumor; he then opened the whole cavity of the tumor itſelf; both ligatures came away on the eleventh and twelfth days, and with the laſt ligature the ſac itſelf came away. When the ſac ſloughed off it left the hollow ſore as large as the ſac, and the ſides ſwelling around the baſin or hollow, formed a cavity much deeper than the ſac which had ſloughed off from it; in ſhort, the ulcer was ſo deep and large, that no one could behold it without horror. The unequivocal terms in which Guattani explains the ſloughing of this great ſac, deſerves to be recorded: " Hac methodo, feliciter perveni ad undicimum diem, quo inferius vincula ſuo ſponte cecidit, eademque ultra proferens die duodecima etiam ſuperiori vinculo una cum ſacco putrefacto elebante, ulcus optime abſterſum emundatumque reditum eſt. Illud autem decem tranſverſi digitos longum, fere

The pathology of a tied artery is thus reduced to common principles; the obliteration and adhesion of a wounded artery, is truly compared with the reunion of any other wound; and one subject of inquiry alone remains, the most important perhaps in surgery, "What are the causes which prevent the adhesion and obliteration of an artery, and produce ulceration in its coats? for the causes which thus produce ulceration and prevent adhesion of the artery, occasion those secondary hæmorrhages of which so many patients die! We never leave our patient bleeding, but it often happens, that in the course of a few days after aneurism or amputation, the blood bursts out suddenly and our patient bleeds to death! Direct hæmorrhagy from a recent wound is easily suppressed, for we see the artery and can tie it; but this secondary hæmorrhagy is peculiarly dangerous, it comes upon us when we are least aware, the parts are ulcerated, or mortified, and the bleeding artery is no longer to be found.

## OF THE CAUSES OF SECONDARY HÆMORRAGY; AND, FIRST, OF BURSTING OF THE ARTERY FROM THE DISEASED STATE OF ITS COATS.

The bursting of an artery after it seems securely tied, arises sometimes from the unfavourable state of the artery, and from its being incapable of adhesion, but much more frequently does it happen from that process which should terminate in adhesion of the artery, proceeding to inflammation, and ulceration of the arterial coats. The diseases of the arterial system have not been even slightly investigated! There are few people who have passed their grand climacteric without having the condition of the whole arterial system very remarkably changed. The extreme arteries, the active arteries, in all parts of the system, are less affected, they preserve their natural pliancy; but the great arteries which serve but to conduct the blood, and whose contraction is less important to the existence of life, are remarkably affected. We are sensible towards the decline of life, of changes in the great arterial trunks, plainly unfavourable to our opera-

omnem a decidente facco relictam, conservabat, et ob superadditam labrorum tumefactionem majori etiam donatum erat profunditate quam illa fuerat quæ faccum aneurismaticum coercebat. Uno verbo ulcus, hoc ejusmodi erat ut ad illius aspectum omnes horrore perfunderentur."

tions; the cellular ſubſtance which joins the coats of the arteries is diſeaſed; the whole tube is but ill diſpoſed to paſs through thoſe changes which are familiar to the other ſoft parts. They do not adhere, inflame, thicken, and obliterate, as ſound parts do! In diſſecting an aged ſubject, we always find the arteries leſs pliant, ſometimes they are contracted, ſometimes enlarged, they become white, and their coats thickened and leſs connected with each other, ſeparate like the coats of an onion into ten or twelve, or into innumerable lamellæ; they are at the ſame time brittle, and fragile, and have a criſped feell; they are ſometimes oſſified; they break or crack when we attempt to bend them; and the drawing of a ligature round ſuch an artery tears it from want of pliancy! our anatomical injections are ſucceſsful only in very young ſubjects; while in older ſubjects the arteries burſt becauſe they have loſt their ſtrength; or tear under the neceſſary ligatures becauſe they have loſt their pliancy! the anatomiſt knows by the firſt touch of the femoral artery, for example, whether his ſubject will bear to be injected! and the ſurgeon in like manner often foreſees by the firſt touch of his finger, thoſe burſtings of the artery and ſecondary hæmorrhages of which ſo many have died.

Thus it often happens, that the artery, too hard to bear a ligature, breaks and tears acroſs in the very moment of drawing the ligature; the artery muſt no doubt have been in this condition, which gave the celebrated Petit ſo much trouble and anxiety in the caſe of Mr. Seneuze the bookſeller. Mr. Petit having amputated this gentleman's thigh, found that the femoral artery was nothing affected, neither by the tourniquet nor by the ligature; and he was obliged in the end to ſuppreſs the hæmorrhagy by compreſſes piled upon the face of the ſtump, and braced down with very firm rollers. It muſt alſo have been an artery of this kind, by the burſting of which Mr. Acrell had almoſt loſt his patient; for the artery did not ſtand the ligature one moment, but in a manner burſt under his fingers! The caſe is as follows:

" A ſoldier, of a ſcorbutic habit, extremely weak and convaleſcent, was ſtabbed unfortunately with a pointed knife in the femoral artery, about ſeven inches under Paupart's ligament; and the wound bled ſo furiouſly that he fainted: A phyſician, who was called, bound it up ſo effectually with compreſs and bandage, that he ſtopped the bleeding for twelve days; but the blood burſt out again on the thirteenth day; notwithſtanding which, the outward wound healed, the aneuriſmal tumor was diſtinctly formed, and by the twentieth day it beat very ſtrongly, threat-

ening rupture. Acrell thinking the aneuriſm too large to be cured by compreſſion, propoſed to tie the artery; he opened the tumor; ſcooped, and waſhed out the very black and fœtid blood, and expoſed the artery, which he found dilated for about four inches into a large ſac of about three quarters of an inch in diameter. He then tied the artery with one ligature above, but behold while he was drawing the lower ligature, the artery ſuddenly burſt above the upper ligature, and threw out its blood with ſuch force, that in leſs than a minute the man had loſt fully four pounds of blood *." This artery tore under the preſſure of the ligature; the tourniquet could not command the hæmorrhagy; the ligature itſelf was ineffectual. In theſe diſtreſſing circumſtances, Acrell at laſt ſuppreſſed the hæmorrhagy by ſponges and compreſſion! with his ſponges and compreſſes, he "filled up the whole cavity of the aneuriſm; and to enſure a proper compreſſion, he made a ſheath for the thigh of white iron, with a globular compreſs upon its internal ſurface, adapted to the place of the wounded artery." Thus he accompliſhed the cure, and the caſe is a ſingular example of the artery in that very ſtate which I have deſcribed breaking under the ligature! giving way in the very moment of the operation.

* Scorbuto atque febre tertiana protracta quam maxime debilitato militi cuidam permoleſte accidit, ut cultro incaute, ſeptem pollicum a ligamento Fallopiano diſtantia, vulnus femori ſuo interno infligens, arteriam ipſam ſimul aperiret, quo ſpumeus torrens initio tam vehementer proſiluit, ut animo fere linqueretur læſus: proprio vero marte demum hac vice ſubſtitit. Caute tamen Medicus vocatus, ad præcludendum ſanguinis erumpentis exitum, ſpleniolis et faſciis membrum conſtrinxit, eoque ad duodecimum uſque diem novos hæmorrhagiæ infultus impedire potuit. Cum vero jam tertio aut quinto quoque die vulnuſculum iterum ſangxinem funderet, et vigeſimo die tumor aneuriſmaticus cum pulſu diſtinctiſſimo exſurgeret, iſque, octo præterlapſis diebus, rupturam minaretur, operationi æger ſeſe ſubjecit, quam ill. ACREL ob magnitudinem et ſuffuſionem, non compreſſione, ſed ligatura perfecit. Repurgato nempe, poſt inciſionem primam vulnere a concreto jamque valde fœtente ſanguine, et denudata, donec injiciendæ ligaturæ locus in conſpectum veniret arteria, quam farciminis inſtar ad 8 linearum diametrum et manus tranſverſæ longitudinem dilatatam invenit, primam ſuperiorem ligaturam applicavit. Cum vero inferiorem contraheret, ex inopinato arteria ſupra ſuperiorem ligaturam diſrupit, unde tanta vehementia vitalis latex prorupit, ut intra minuti ſpatium quatuor ad minimum libræ effluxerint. "His in horrendis anguſtiis, cum nec nova ligatura, nec torcularis contractione hæmorrhagia ſiſti poſſet, in trunco ipſo, dum ex inguine prolabitur, pollicibus firmiter admotis, compreſſionem inſtituere placuit, quo effluxus ſubſtitit." Atque tum, ſpongiæ fruſtulis ad arteriam diſruptam directis, compreſſionem tentare coactus fuit. Eorumque effectus, toto cavo his ipſis repleto, jam exoptatiſſimus fuit. Sed vim comprimentem adaugere meditans, laminam ferream, formæ femoris adaptatam et globo in concavam faciem ferruminato inſtructam, femori ita applicavit, ut globus in arteriam diſruptam vim ſuam exerceret. Atque ſic, nec nova hæmorrhagia, nec ullum aliud incommodum, a ligata et compreſſa arteria metuendum, ſub reliqua cura ſpem perfectæ curationis conceptam ſufflaminavit.

But beſides being thus hard, and apt to break under a ligature, ſuch artery is alſo callous, ſo as to be unapt to adhere; and thick in its walls, ſo that it is no eaſily compreſſed; and very often this unfavourable condition of the artery is rendered more dangerous by the awkward manner in which the ligature is applied. Thus the femoral artery having its walls thickened, its cellular ſubſtance unſound, its coats not cloſely connected, but rather apt to ſeparate, the internal ſurfaces can never be neatly applied to each other, for in conſequence of the great caliber of the artery, and of its cylindrical form, of the thickneſs of its coats, and of the want of pliancy of the whole tube! in place of flattening, when the ſurgeon applies his ligature, it is puckered and purſed up. Beſides, I daily obſerve operators uſing ligatures for the femoral artery, as thick as common tapes, the loops of which, when twiſted and drawn in the form of a ſurgeon's knot, are actually larger than the arteries round which they are applied; ſo large indeed, that it is impoſſible to draw them cloſe.

Mr. Duchamps, a French author, mentions one operation for aneuriſm, in which the ſurgeon actually could not draw his great ligature tight enough to ſuppreſs the bleeding; and from this cauſe alone, he was forced to cut off the limb; an artery thus diſeaſed is apt to tear under the ligature; or if it be ſtrong enough to bear the ligature, by being callous, it fails to unite; the interruption which the ligature gives to the blood is mechanical only! no adheſion enſues to continue the reſiſtance! and of courſe when the ligature falls off, the artery opens, and the hæmorrhagy returns.

## OF BURSTING OF THE ARTERY FROM ULCERATION OF ITS COATS.

Yet it is not to this unhealthy condition of an artery that I aſcribe the death of thoſe who have periſhed from ſecondary hæmorrhagy. The indiſpoſition of the arteries never can explain the difference of danger in the two operations of aneuriſm and amputation.—In amputation of the thigh we tie the great femoral artery; we tie alſo the profunda, and its muſcular branches; we perform amputation daily, and we tie many great arteries in each amputation; each ligature is ſeen moved and raiſed up from the face of the ſtump at every pulſe of the artery; the ſtump remains open. Theſe arteries continue for weeks to bear the whole force of the circulation, unſupported, yet they never give way.

But, in the operation for aneuriſm of the thigh, the difference of ſecurity is very great; for this operation is, on the other hand, ſo full of uncertainty and danger, that hardly any caſe can be mentioned in which the ſurgeons have not been alarmed, and the patient in great danger, from ſecondary hæmorrhages: It is an operation never performed but by ſurgeons of the firſt eminence; and yet more, perhaps, have died than have ſurvived it. Hunter himſelf has loſt his patients; thoſe whom he did ſave were endangered by ſecondary hæmorrhages: and concerning the celebrated Mr. Pott, (who, from the ill ſucceſs of one operation, was forced to amputate the thigh), it has been inſinuated, that he miſſed the artery altogether: "The depth of the inciſion made it impoſſible for any but the operator himſelf, and thoſe who were immediately aſſiſting him, to ſee what was included in the ligature, *and at the time* the popliteal artery was *ſuppoſed* to be ſecured by it." From this foul accuſation I ſhall find an opportunity of defending the memory of Mr. Pott. I mean only to explain to you at preſent, that even the greateſt ſurgeons have not been free from reproach; and, indeed, the imputation is fairly eſtabliſhed, not againſt particular ſurgeons, but againſt the ſcience itſelf, "That the rules of ſurgery in reſpect to aneuriſms are imperfect." It behoves us then to inquire, What the difference is betwixt tying the femoral artery in aneuriſm, an operation ſo full of difficulty and danger; and tying the ſame artery in amputation, an operation which is ſo perfectly ſafe, that the death of a patient by hæmorrhagy would be a flagrant diſgrace?"

SECONDARY HÆMORRHAGY ariſes from ULCERATION of the ARTERY more frequently than from any other cauſe! In amputation, ſuch ulceration happens only when the ligatures, having been firmly tied round the nerves, are prevented from ſlipping off, or when the whole ſurface of the ſtump falls into diſeaſe, and is eroded; but in aneuriſm it is peculiarly frequent, from the manner in which a great length of the artery is inſulated and detached from the ſurrounding parts. Surgeons have been uſed to few bowels, as if they had no comprehenſion of ſucceeding otherwiſe than by the mere firmneſs of the future! as if nature had nothing to do in the cure! In like manner, in tying arteries, they pull their ligatures with a firmneſs that defeats its purpoſe, here alſo they ſeem to depend entirely upon the mere mechanical force, as if there were no proceſs of nature to follow this mechanical ſtricture, nor to ſupport the artery when the ligature is withdrawn.

If the ſurgeon, forgetting how ſlight a force ſuffices for ſuppreſſing the pulſe

of a naked artery, and for laying its ſides in contact, pulls his ligature with all the firmneſs which the artery can bear, although the artery be not immediately cut acroſs, its coats may be twiſted and weakened; or, though not even weakened, they may be ſo violently compreſſed that not only the portion of the tube intercepted between the two ligatures, but the part immediately under each ligature will fall directly into gangrene in place of adhering, ſo that, on the third day, when the ligature is withdrawn, it may bring along with it the end of the artery.

If the ſurgeon, in place of diſſecting the artery fairly, ſtrikes his needle coarſely under it, and includes much of the muſcular ſubſtance, or other ſoft parts, the preſſure never is ſufficient, it is even, at the firſt, inſufficient from the ſoftneſs and yielding of the parts, there is little preſſure, there is no adheſion of the artery under the ligatures, there is no amputation of the intercepted part of it! the cellular ſubſtance and muſcular fleſh fade and give way on the third or fourth day: But the artery itſelf is ſtill entire, and the blood, by this ſlackening of the ligatures, paſſes along the canal of the artery, and out at the wounded point; and as the ſtructure of the artery is but little affected by ſo ſlack a ligature, the artery continues entire, the ligature keeps its place round the artery, and, though it does not compreſs the artery, it irritates it, and is never diſengaged till the artery falls into ulceration and burſts.

If the ſurgeon be ſtill more awkward in his operations, he will not merely ſtrike his needle through the fleſh, but will take the nerve into the loop of his ligature! for every great artery has the great nerve of the limb accompanying it, the brachial artery has the great radial nerve, the femoral artery has the great anterior crural nerve, the great artery, nerve, and internal veins of each limb, lie in a peculiar ſheath, and, in order to tie the artery apart from the vein and nerve, it is neceſſary not only to cut up the general faſcia of the arm or thigh, but to diſſect this peculiar ſheath of cellular ſubſtance. Now, authors have always talked ſlightly of tying the nerve, as if the tying it related only to the nerve itſelf! No! it relates to the ſecurity of the artery! an artery, tied with a ligature, is deſtroyed in a few days, but a nerve tied with a ligature is hardly affected by it: The nerves are peculiarly ſtrong, their coats hard and firm, a ligature tied round a nerve and artery together, as it cannot deſtroy the nerve, keeps its hold upon the artery, till, by the irritation of the ligature, and other obvious cauſes, it ulcerates and burſts; or if this can be prevented, it is only by cut-

ting the ligature timeouſly away, which cannot be done without a degree of difficulty and danger.

But there are ſtill other cauſes of the ulceration of arteries. If the ſurgeon, anxious to enſure the obliteration of the artery, reſolves to lay a conſiderable length of the ſides of it in contact, what does he do but inſulate the artery, tear it up from its bed among the cellular ſubſtance, ſeparate it from all thoſe vaſcular connections which kept it alive! he expoſes it to almoſt inevitable ulceration? This has been practiſed upon the femoral artery in a great variety of ways, all of them ingenious, but all in direct oppoſition to the principles of ſurgery. Thus we have an operation of Mr. Cline of St. Thomas's Hoſpital, very confuſedly deſcribed, where the artery muſt have been completely ſeparated from all thoſe connections by which it is nouriſhed and ſupported in its natural ſtate. The caſe is related by Mr. Home*, who is generous enough to acknowledge that Mr. Cline had no ſhare in drawing up the report. He begins thus: "The particulars of the caſe I have not received from Mr. Cline, but have taken them from my own obſervation, and the information of gentlemen who attended the patient, and were preſent at the examination after death. The patient was a ſailor, who came into St. Thomas's Hoſpital, to undergo the operation for the popliteal aneuriſm. Mr. Cline made a longitudinal inciſion on the anterior part of the thigh; and, having laid bare the artery, paſſed, by means of a tin inſtrument, a double tape, about one inch broad, behind the artery, the two pieces of tape lying one over the other; the piece of tin, which conducted the tape, was cut off, and a cork, nearly an inch long, was laid upon the artery, and confined to its ſituation by means of the upper tape, producing in this way a ſufficient preſſure upon the veſſel included between the ligature and cork, to ſtop the circulation, and conſequently the pulſation of the tumor in the ham; the other portion of the tape was left looſe. The intention of ſecuring the artery in this way, was to compreſs the ſides of the veſſel together, *and produce an union without ulceration!!!*"

"The patient went on very well, and the ninth day the tapes was removed, and every thing ſeemed to be going on very favourably, when the patient was attacked by a fever, (which was ſuppoſed to be from another patient in the ſame ward), of which he died. Upon examining the ſtate of the limb after death, it was found that ulceration had taken place through the whole extent of the arte-

* The Mr. Home that writes on the Urethra.

ry included in the tape; and ſinuſes were formed both upwards and downwards, in the courſe of the thigh, to ſome diſtance."

Let us obſerve, for a moment, what muſt have been the condition of this artery? The blood was ſcooped out from around it, the cellular ſubſtance deſtroyed, and indeed almoſt gangrenous from the injection of the blood into it: The artery being thus entirely inſulated, a cork of an inch long was laid along it, a tape of an inch broad was tied round it, and thus the artery was included betwixt the tape and the cork, while another doubling of the tape lay under the artery, a little higher up, to be uſed as a ſecond ligature, when occaſion might require. Thus ſome inches of the artery were inſulated; the artery itſelf lay acroſs the great ſac of the aneuriſm, like a ſtring acroſs a bow; this operation was undertaken with notions of the cure, which never could be fulfilled; it was thought poſſible to compreſs the artery ſo curiouſly, and with ſuch a nicely regulated preſſure, "as to prevent the blood paſſing along the artery, but without cauſing ulceration," or, in other terms, without cutting the artery acroſs! But the impoſſibility of ſucceeding thus, is plain, from the radical propoſition which I have juſt laid down, "it is impoſſible to intercept a piece of the arterial tube *ſo* betwixt two ligatures as to cut it off, without cauſing the two ends of the artery to adhere at the points where the ligature preſſes them together;" and the converſe of the propoſition is equally true; "that it is impoſſible to check the blood in an artery, to compreſs the tube, to lay its ſides ſo cloſely together as to produce adheſion without cutting off the intermediate piece." The impoſſibility of ſucceeding in ſuch an intention is ſufficiently proved by reaſoning, but the danger of the attempt is demonſtrated by the iſſue of this caſe, which is juſt what might have been foretold: "Ulceration had taken place through the whole extent of the artery included in the tape;" ſinuſes alſo had extended along the bed of the artery; had this patient ſurvived the fever which attacked him, the artery muſt have burſt out, he muſt have died of ſecondary hæmorrhagy.

It is this ulcerated ſtate of the artery that makes it neceſſary to apply ſucceſſive ligatures! and it is this diſeaſed condition of the artery, this progreſſive ulceration, that makes thoſe ſucceſſive ligatures give way. In operations upon the femoral artery, it is firſt of all inſulated by the great extenſion of the ſac in which it lies; it is in danger of being eroded by the very fœtid matter which always fills a great aneuriſmal ſac, diſtended with corrupted blood and ſanies; and it is ſure to ulcerate from the coarſe and complicated apparatus with which it is tied. It is uſual-

ly laid out along a cork, or tied down along a piece of bent-leather, which was uſed indeed by Ruiſch in one of the firſt operations of the kind that ever was performed *. I find Mr. Duſchamps uſing a ſmall machine made of ſilver, conſiſting of a horizontal plate, which lies upon the artery; and in this plate there are two ſlits through which the tape paſſes, which ſurrounds the artery; from the middle of this flat plate, ſtands up a ſhaft of ſome inches in length, over which the ends of the tape or ligature are tied. Concerning theſe machines, I feel that I do no more than juſtice, when I acknowledge the ingenuity of the inventions; but to you I ſhould do great injuſtice, if I did not proteſt againſt them as altogether inconſiſtent with the principles of ſurgery.

Theſe contrivances for inſulating the artery are ſure to cauſe that ulceration, which too many natural cauſes conſpire to produce. The laying a piece of cork or bent-leather along the artery, the uſing ſuch an inſtrument as this of Mr. Duſchamps, the laying relays of ligatures above and below the place where the proper ligatures are applied, the tying a conſiderable length of the arterial canal with four thick coarſe ligatures in place of two! the ſtripping a conſiderable extent of the artery of its cellular ſubſtance! the ſurrounding the artery with pellets of ſcraped lint, and keeping it extended acroſs the foul and gangrenous ſac, like a water-pipe acroſs a hollow piece of ground! are, I think, the moſt certain means of cauſing ulceration. It is indeed here, as in many operations, that the more the ſurgeon truſts to his own curious machines and firm ligatures, and the leſs he truſts to nature; or, in other words, the more of this coarſe mechanical ingenuity the ſurgeon diſplays, the greater will his patient's danger be.

But there are various cauſes of this eroſion and ulceration of the artery, and, among others, the foul ſuppuration of the aneuriſmal ſac; for the cleanſing of an aneuriſmal ſac is like the ſloughing of a gunſhot wound; it is rather a gangrene and ſloughing than a proper ſuppuration of the cavity. I know of no ſore more difficult to heal than an aneuriſmal ſac; it ſometimes falls into actual gangrene; and this peculiar condition of it depends not upon the putrid tendency of the blood, but upon the force with which the blood is driven in, and, as it were, injected among the cellular ſubſtance. When blood, either from the burſting of ſmaller veſſels, or from ſome more important aneuriſm, lies upon a bone, the bone is corrupted, and this caries is aſcribed to the putrid tendency or diſſolving power

* Ligabanturque exiguo fruſto corii craſſioris munitæ ad arteriæ diſciſſionem vitandam.——Ruiſch.

of the blood! while it proceeds merely from this blood being driven into the cellular ſubſtance which ſurrounds the bone! for the blood thus driven into the cellular ſubſtance, either ſeparates the perioſteum from the bone, by being injected under it, or injures and deadens the perioſteum, by being driven into the cellular ſubſtance of its outer layer; the perioſteum is thus either directly detached, or ſoon detaches itſelf from the bone; and the bone, thus deprived of its nutritious membrane, becomes carious. Thus it happens that in the operation for aneuriſm, or upon opening the body after death, fragments of the bone are ſometimes found detached, floating even in the blood, and then it is proclaimed that the bone has been in part diſſolved by the blood, as if the blood were as peculiar in its nature as the Liquor Gaſtricus of a dog *.

The pathology of the aneuriſmal ſac is nearly the ſame with this of a diſeaſed bone. The blood is injected among the cellular ſubſtance, the parts are ſeparated from each other, a foreign body (the blood) is driven in betwixt every fibre! the parts are moreover compreſſed by the general tenſion of the tumor, and all the parts are like the artery itſelf inſulated, deprived of nouriſhment, ready to fall into gangrene. The aneuriſmal ſac either falls into actual gangrene and burſts, or is at leaſt on the borders of gangrene before it is opened. The preſſure is reciprocal, and the ſurface does not thus give way before the parts within the ſac are ready to fall into univerſal ulceration and to ſlough off; and when the ſac burſts or is opened, the putrefaction of the blood augments the natural fœtor and foulneſs of the ſuppuration. This is the reaſon of ſuppurations extending along the bed of the artery, for the blood is driven along in that ſheath of cellular ſubſtance which ſurrounds it; this is the reaſon of the ulceration and eroſion extending all along the inſulated portion of the arterial canal; this is the reaſon of ligature after ligature giving way; and this is the reaſon why the artery is often more dangerouſly affected, more diſeaſed and ulcerated even in recent wounds, than in natural aneuriſm and ſpontaneous dilatation of the artery! burſting of arteries, yielding of ligatures, ſudden and fatal hæmorrhages are as frequent in recent wounds as in old aneuriſms!

* "Sir John Pringle told me, ſays Dr. Monro, that he digeſted bones in putrid blood, but did not find that the blood had the leaſt effect in diſſolving them as a menſtruum. The *ſtream of blood indeed, by continually waſhing the parts of the bones, laid bare by aneuriſms, prevents the oily matter ſeparated from the bones from ſtagnating and acquiring* the ſtrong fœtid ſmell and high degree of corruption obſerved in other caries." Theſe are indeed curious and important ſpeculations. Dr. Hunter's account of the corrupting power of the blood, viz. Med. Obſerv. and Inquiries, is much of the ſame complexion.

Mr. Leſlie performed the operation for femoral aneuriſm upon a boy, whoſe artery had been ſtruck with a pen knife, and whoſe aneuriſm had increaſed for three weeks, and then burſt ſo as to endanger his life. This aneuriſm was recent, and was from a direct wound of the artery; it was in a young and healthy boy. Mr. Leſlie had not only tied the artery ſecurely, but had taken every precaution by proper compreſſes (and by tightening the tourniquet a very little) to moderate the force of the blood, " yet in half an hour after the operation, a freſh alarm was given, and the flux of blood appeared as great as at firſt." " He found, upon removing the dreſſings, that the firſt ligature had cut through the adjacent parts, which, from the operation being ſo long delayed, *had become putrid, and unable to make ſufficient reſiſtance;* by this means the preſſure of the ligature upon the veſſel was removed *." If this be the condition of the other parts, what muſt be the ſtate of the artery itſelf, lying inſulated in the centre of ſuch a ſac? What can this portion of the artery be good for, inſulated, ulcerated, unfit in all reſpects to bear ligatures even in the firſt inſtance, and ſure to give way under them in not many days?

It is from not foreſeeing the ill conſequences of it that the operator is tempted to go upon this dangerous ground; he ties the artery; he is at pains to keep it inſulated; he is happy to think, that though it ſhould give way, it will be within his reach; he knows where to find it; it burſts, and he ties it again. But in place of conſidering this part of the artery as of any value or likely to be uſeful, he would do well to conſider it as dangerous; he ſhould not by any means apply his ligatures cloſe upon the breach or wound in the artery under pretence of ſaving inoſculating branches; he ſhould rather conſider this as a portion of the artery, which, before the cure be accompliſhed, muſt be inevitably deſtroyed; he ſhould tie the artery at the two extremities of the ſac, as cloſe as poſſible to the ſurrounding fleſh; and ſhould then cut it acroſs, that it may ſhrink for protection among the fleſh and heal ſoundly along with the reſt of the ſuppurating ſac.

## OF SECONDARY HÆMORRHAGY FROM THE INOSCULATING BRANCHES.

There is ſtill another kind of ſecondary hæmorrhagy, which ariſes neither from the fading of the parts, the ſlipping of the ligature, the burſting of the

*Vid. Dr. Duncan's Medical Commentary, Vol. II. p. 178.

artery, nor any other cauſe that has hitherto been imagined. The hæmorrhagy which I am now going to explain, does not even proceed from the main trunk of the artery; but, on the contrary, the life of the patient is endangered by hæmorrhagy from thoſe very inoſculating arteries upon which ſurgeons have always depended for the ſafety of the limb. It happens thus:

In every part of a limb, but eſpecially round every joint, there are frequent inoſculations of the ſmaller arterial branches, and they are thence named the ARTICULAR OR INOSCULATING ARTERIES. While the circulation in the main trunk of the artery is languid, theſe are gradually enlarging; when the aneuriſm is near burſting, the preſſure upon all the adjacent parts is very great, and the articulating or inoſculating arteries are ſtill more enlarged; and the moment the operation of tying the main artery is performed, the whole blood of the limb paſſes through thoſe arteries. Theſe lateral arteries act with particular vigour, they inoſculate very freely round the ſac; ſometimes branches of them are cut in the time of the operation, often they are eroded from the ulceration and gangrenous condition of the ſac. This is a frequent cauſe of ſecondary hæmorrhagy, and much to be feared; the patient does not indeed expire with one guſh of blood, as ſometimes happens when the main artery of the thigh is ulcerated and gives way; theſe inoſculating arteries lie deep at the bottom of the gangrenous ſac; they are eroded, burſt out, and fill the ſac with blood; and before the ſurgeon can be called, or that blood cleaned out, the arteries have ceaſed to bleed, and are no longer to be found.

One thing more is particularly worthy of obſervation in regard to thoſe arteries, that not only are they eroded when they are thus expoſed in the bottom of an ulcerating ſac; but in thoſe caſes where the ſac is left entire, (the operation being performed according to Mr. Hunter's manner in the fore part of the thigh), theſe inoſculating arteries open upon the internal ſurface of the ſac, they convey that blood which ſhould nouriſh the limb directly into the aneuriſmal ſac; and though the main artery be actually ſtopped with a ligature in the fore part of the thigh, the pulſation of the aneuriſmal tumor in the ham returns upon the ſecond or third day. Some years after the death of the late celebrated Mr. Pott, the following narrative of one of his operations was publiſhed: But, however correctly the facts may be ſtated, I will not allow myſelf to recite the caſe to you, without ſtrongly expreſſing my diſapprobation of many implied reproaches,

which never ſhould have been thus publicly expreſſed, and, leaſt of all, after Mr. Pott's death.

" This mode of operating was adopted by Mr. Pott in a caſe of popliteal aneuriſm in St. Bartholomew's Hoſpital; which operation having been the object of medical attention for ſome time, I ſhall give a brief account of it, as I was preſent at the time it was performed."

" Mr. Pott began the operation by an inciſion, about five inches in length, upon the poſterior part of the thigh, through the common integuments, a little higher than the tumor, and in the direction of the thigh, between the two hamſtrings; he thence diſſected down to the veſſels at the upper end of the inciſion, which being there deep ſeated, proved both tedious and difficult. Having come to the veſſels, a double ligature was paſſed, and the two portions tied ſeparately, at nearly half an inch diſtance. The depth of the inciſion made it difficult for any but the operator, and thoſe immediately aſſiſting him, to ſee what was included in the ligature, and at the time the popliteal artery was ſuppoſed to be ſecured by it. The wound was dreſſed up in the common way. The ſecond day after the operation, a pulſation was felt in the tumor, which afterwards enlarged ſo much, that Mr. Pott amputated the limb."

" It is ſaid, that the aneuriſm appeared, upon examination of the limb, to have been in an anaſtomoſing branch, not in the trunk of the artery *."

" The following remarks upon this operation will tend, in ſome meaſure, to illuſtrate the method recommended and practiſed by Mr. Hunter. The mode of taking up the artery in the ham muſt be always unfavourable to the future ſucceſs of the operation, if either the artery itſelf ſhould be diſeaſed, or if the tumor, by being ſo contiguous to the violence done in the operation, ſhould be affected by the conſequent inflammation, which ſeems to have been the caſe in Mr. Pott's operation, as I underſtand two abſceſſes were formed cloſe to the ſides of the ſac. Had the aneuriſm been ſituated in an anaſtomoſing branch of the popliteal artery, given off below the ligature, there ſhould have been no pulſation afterwards in the tumor; and were it in a branch going off above the ligature, the pulſation in the tumor ſhould have continued immediately after the operation, and ſhould have been increaſed by it, neither of which effects appear really

* How miſerably ignorant muſt that perſon be of inoſculating arteries, and every thing of the kind, who can talk of an aneuriſm o the ham! being formed by an inoſculating artery!

to have taken place, which throws a doubt upon the ſituation of the aneuriſm, if the popliteal artery was rendered impervious by the compreſſion of the ligature."

This caſe is a curious and happy illuſtration of the piece of pathology I have juſt explained to you. The inſinuation contained in theſe words, "It was difficult for any but the operator to ſee," "the popliteal artery was ſuppoſed to be ſecured," &c. are very unbecoming. The pulſation returning the ſecond day is an acknowledgment that the pulſation had actually ceaſed! The pulſation of the tumor could not have ceaſed the inſtant of the operation, nor have continued abſent for two days, unleſs the femoral artery had been actually tied! it could not have returned from the ligature round the artery failing, for the artery was tied in a very ſecure manner with two ligatures, the one half an inch above the other. Had the pulſation returned from the ſudden yielding of the ligature round the artery, the effect muſt have been ſudden! but the ſecond day after the operation, that pulſation was felt in the tumor, which afterwards enlarged ſo much that Mr. Pott amputated the limb." This implies a ſlow enlargement of the aneuriſm, ſuch as might ariſe from the aneuriſmal ſac being gradually filled by ſome inoſculating artery. The illuſtrative remarks about the inoſculating arteries only demonſtrate how little the gentleman who wrote thoſe cruel reflections knew about the effect of inoſculating arteries. But as if Providence had deſigned a judgment upon him, the very ſame misfortune happened to himſelf in the following caſe:

"A labouring man, who was employed about a pipe manufactory in collecting and carrying the pipes, felt, after a long walk, an indiſtinct heavy kind of pain extending down the calf of his right leg. This firſt pain very ſoon ceaſed, but it returned from time to time as he reſumed his wonted employment, and became daily more frequent and violent, till he was forced to confine himſelf; then, for the firſt time, he obſerved a tumor in his ham; and when in the end he preſented himſelf at the Hoſpital, there was formed a popliteal aneuriſm of conſiderable ſize, painful, pulſating ſtrongly, with a throbbing motion, not only perceptible to the touch, but manifeſt to the eye."

"The operation for popliteal aneuriſm was performed according to Mr. Hunter's method, with perfect ſucceſs; the artery was tied in the fore part of the thigh; the aneuriſm in the ham was left untouched; the pulſation of it ceaſed the moment the ligature was drawn; the ligature came away eaſily on the 12th

day; the wound healed; the tumor in the ham ſubſided rapidly; and in three weeks he was almoſt well."

"But during the cure of this aneuriſm, it was obſerved that another was forming in the artery of the left ham. As ſoon therefore as his health was ſomewhat reſtored by country air, he was brought once more to the Hoſpital to undergo the ſame operation in the other leg. This ſecond aneuriſm had now acquired an alarming ſize; the operation was performed; and the pulſation in the aneuriſm ceaſed the moment the ligature was drawn upon the artery on the fore part of the thigh; but the following morning the patient was ſenſible of a violent throbbing in the tumor; and though the ſurgeon could not feel any pulſation, the pupils felt it. On the next day, the third from the operation, this queſtion was decided; the pulſation was manifeſt to the eye as well as to the hand of every one; and the force of the pulſation diſtinctly increaſing was the reaſon of calling a conſultation wherein amputation was ſtrenuouſly recommended by the other ſurgeons of the Hoſpital; but the operator himſelf was more prudent, and wiſhed to try for a few days at leaſt the effect of compreſſion. The wound in the fore part of the thigh looked unhealthy; at the end of the week a hæmorrhagy took place; the blood flowed profuſely, yet was eaſily ſtopped; it returned no leſs than four times within the twenty-four hours, but not a great deal of blood was loſt."

"On the morning of the tenth day, the ſurgeon pulled at the ligature, but without getting it away; having pulled with ſome force, a ſmart hæmorrhagy followed; the ſtream of blood was florid, and flowed, per ſaltim, but it was ſmall, and could not be from the femoral artery, it muſt have been a branch only. The compreſs was now removed from the tumor of the ham, leſt the blood ſhould be hindered from paſſing downwards; and was applied to the wound over the ligature to reſtrain the hæmorrhagy."

"The hæmorrhagy was thus ſuppreſſed; but this compreſſion of the wound produced a very violent ſwelling and inflammation, threatening abſceſs. It was only on the ſixteenth day that the ligature came away; the compreſs was removed; the patient was bled, and kept very low, and in two days the ſymptoms of inflammation ſubſided; and the pulſation of the aneuriſmal ſac, which had become very ſtrong, entirely ceaſed."

I will not call thoſe cruel remarks on Mr. Pott a poſthumous aſſaſſination, nor name the perſon who could commit the act; I ſay nothing ſevere of his own operation; I accuſe him of nothing wrong. I believe ſincerely that there was no-

thing in this operation done imprudently, nothing left undone. I am indeed informed, upon the very beſt authority, that his operation was dexterouſly and rapidly performed; but, by thus liberally acquitting him of any fault in his own operation, I leave him but the more reſponſible for what he has ſaid concerning ſo great a ſurgeon as Mr. Pott; and I ſtate both caſes in proof of theſe pathological concluſions, "That often ſecondary hæmorrhagy ariſes from theſe anaſtomoſing arteries being dilated and eroded, or wounded in the operation, the blood welling out at various points from the walls and bottom of the ſac;" and "that not unfrequently, after the great artery of the limb has been fairly tied, the aneuriſmal ſac fills again, the pulſation is renewed, and the aneuriſm reſumes its characteriſtic marks, in conſequence of ſome inoſculating artery pouring its blood into the ſac. From the moment of the operation for aneuriſm the inoſculating arteries are enlarging! by the ſecond or third day they are able to communicate their pulſation to the ſac juſt as in performing the operation for aneuriſm of the arm, the pulſe of the wriſt is felt by the evening of the ſecond day. But of this ſecondary aneuriſm I ſhould be leſs afraid than of a ſecondary bleeding; for the preſſure of the effuſed blood, the weight of the ſurrounding parts, the reſiſtance even of the ſac itſelf, theſe forces, which cannot indeed reſiſt the whole force of the femoral artery, will certainly be able to oppoſe that of an inoſculating branch no bigger than a crow quill. While the ſac is filling with blood, the increaſing pulſation of the bag becoming ſtronger and ſtronger every moment, muſt be alarming! yet the reſiſtance will increaſe in due proportion, the tumor will become ſtationary, and a ſlight preſſure will accompliſh the cure; for the inoſculating artery, which is thus active in filling the aneuriſmal ſac, is ſmall, ſolitary, and unſupported; it does not lie in the direct line of the femoral artery, but is always curled; it has no direct communication with the lower arteries, and is not ſolicited to act; in ſhort, it is not like the femoral artery, a parent trunk to many leſſer arteries, whoſe conſtant activity ſolicits a ſtream of blood through it! This inoſculating artery is but one of many enlarged branches, by which the limb is nouriſhed; and no ſooner is it reſiſted by the fullneſs of the ſac which it enters into, and by the increaſing preſſure of the parts, than the blood turns aſide into the other channels, and ceaſes to force the aneuriſmal ſac. There are, beſides, accidents favourable to the cure of this ſecondary aneuriſm, inflammation, for example, as in this laſt operation, where the ſwelled ſtate of the parts increaſes the reſiſtance; and, accordingly, no ſooner

did the inflammatory ſwelling in this caſe ſubſide, than it was diſcovered that this threaening pulſation and extenſion of the aneuriſmal ſac had ceaſed.

In amputation, ſecondary hæmorrhagy happens only, when along with the great artery we have tied in the nerve, and tied it ſo firm, that the ligature will not come away; or, when we have amputated ſo ill that the bone projects, the fleſh ſhrinks, the ſkin retracts, and the whole face of the ſtump, in place of adhering, ulcerates, and opens up; or, laſtly, in thoſe bad conſtitutions of the air, in which hoſpital ulcer is frequent, for when that kind of gangrene opens up a ſtump, the ſloughing is like the ſloughing of a gunſhot wound, or of a foul aneuriſmal ſac, the parts are ſucceſſively deſtroyed, the blood veſſels at laſt give way, one after another, and the patient dies of ſecondary hæmorrhagy.

## CONCLUSION.

Thus have I endeavoured to inveſtigate, in a general way, the cauſes of ſecondary hæmorrhagy: I aſcribe the moſt dangerous bleedings, both in amputation and in aneuriſm, to the ulceration of the great artery; ſome of the cauſes I hope I have explained to your ſatisfaction, and the practical concluſion which I would deduce from this doctrine is of no ſmall importance; it has relation more or leſs direct, to every great operation; and therefore reflect, I beſeech you, on thoſe facts and principles, and judge for yourſelves. It is my opinion, that a great artery never can be ſafe while the ligature remains about it; for till it comes away, the artery cannot be ſaid to have adhered, cannot be buried in granulations, nor ſupported by the ſurrounding fleſh, cannot be out of danger of ulceration! Nor can a great artery ever be ſafe while it remains inſulated, though ſurgeons ſeem to take a pleaſure in ſeeing it lying fair along in the cavity of an aneuriſmal ſac! but they ſhould recollect, that if the artery lies more within their reach of operation it is alſo ſurer to need it; being thus inſulated, ſtripped of its cellular ſubſtance, deprived of its nutritious veſſels, the part which is included betwixt the two ligatures muſt gangrene; the parts under the two ligatures often, in place of adhering, will ulcerate, the ulceration, in place of ſtopping when the ligatures fall off, will continue, and as the artery is an inſenſible and firm part, entering ſlowly into diſeaſe, it ulcerates ſlowly, and burſts only on the tenth, twelfth,

or fifteenth day. We have reaſon then to believe that the oldeſt practice is the beſt; that whenever a great artery is tied, it ſhould be cut acroſs betwixt the two ligatures, that it may ſhrink and bury itſelf among the ſurrounding fleſh. We know two important facts which direct us to this bold practice: Firſt, That wherever we do tie an artery with two ligatures, the intermediate piece is inevitably deſtroyed, and it were ſurely more prudent to cut the part acroſs with the knife, than to allow it to be thus ſlowly deſtroyed by ligatures, with danger of the ulceration extending along the artery thus ſtretched out, and held inſulated. Secondly, We know that though we are never alarmed with the femoral artery burſting in amputation where the ligatures come eaſily away, yet in aneuriſm our ligatures remain too long, they ſeldom looſen till the twelfth or fifteenth day, and there have been few operations in which ſecondary hæmorrhages do not make part of the narrative of the caſe.

I think that, by cutting acroſs the artery, tied in aneuriſm, we ſhould put it nearly in the ſame condition with that tied upon the face of an amputated ſtump. In operating in any conſiderable aneuriſm, then I would be careful to cleanſe the ſac thoroughly of its putrid blood; I would not merely open the general faſcia of the limb, but diſſect carefully that peculiar ſheath which encloſes the great artery, veins, and nerve; I would tie the artery clear of the nerves, which, being indeſtructible, hold the ligatures too long; and I would have it clear alſo of muſcular fleſh, which, while it detains the ligature, prevents it operating fully upon the artery: The bare artery I would tie with moderate firmneſs, with a ligature ſmaller than is commonly uſed, and as near as poſſible to the ſound parts. I would not inſulate it with pieces of leather or cork, nor lay compreſſes along its courſe, but cut it acroſs, that it might ſhrink among the ſurrounding fleſh. In tying a great artery, I would take every precaution that might enſure the effect of the ligature upon the bare artery, and enable me to draw it early away; and I would be eſpecially careful to prevent my ligature being embarraſſed with the ſurrounding parts.

But this ſubject grows too important to be confined within the limits of this diſcourſe, the principles which are here laid down have a very general relation to the ſurgery of arteries; and when I ſhall next proceed in regular order to explain to you the aneuriſms of the great arterial trunks, the ſigns of the diſeaſe, and the uncertainties and difficulties of each operation, you will perhaps feel the importance of thoſe principles which I have endeavoured to eſtabliſh.

# DISCOURSE VI.

## ON INOSCULATION.

A GENERAL SKETCH OF THE ARTERIAL SYSTEM; OF THE IMPORTANCE OF INOSCULATIONS TO THE GENERAL HEALTH AND PRESERVATION OF THE BODY; OF THE FREQUENT INTERRUPTIONS OF THE GREAT ARTERIES, AND OF THE RETROGRADE MOTIONS OF THE BLOOD.

HORROR at the ſight of blood is perhaps one of the moſt natural feelings, and next to that is the apprehenſion, that if hæmorrhagy were ſuppreſſed by tying up the main artery of a limb, gangrene and death would enſue! Gangrene has always been the greateſt terror of the ſurgeon, and the tying a great artery has always been thought the moſt certain cauſe of it. Among the arteries which ſupply the upper and lower extremities, certain inoſculating branches have become remarkable by their importance in diſeaſe; inoſculations have been found (after the operation for aneuriſm), encircling the elbow joint, and ſupplying the place of the main artery; inoſculations round the knee and ham have been ſought for, and are preſumed to exiſt; theſe inoſculations have, of courſe, been particularly noticed, while it has eſcaped obſervation that inoſculation is eſſential to the healthy conſtitution of all parts of the body; that the inoſculation of arteries is not peculiar to any joint, limb, or organ of the body; that the inoſculation of arteries is an eſſential proviſion of Nature for the free circulation of the blood; that no part is without inoſculations ſufficient to ſupport it againſt all obſtructions.

The inteſtines, the ſolid viſcera, the brain, the womb, have their arteries from a variety of ſources; they have many great and ſeparate trunks, but all their branches have frequent inoſculations. In the extremities the joints are ſurrounded in a particular manner with frequent inoſculations, the obſtruction of one artery never hinders the circulation of the blood, but according to the various poſtures of the body, according to the various fullneſs, diſtenſion, and contortion of the viſcera, the blood enters by various channels, and moves at different times,

in oppoſite directions, along the ſame artery: Why, for example, ſhould there be ſo free an inoſculation in the great epiploic arteries of the ſtomach, unleſs the blood moved occaſionally from the left artery into the right, or from the right artery into the left? The womb has its four arteries, with free inoſculations among their ſeveral branches, and is ſupplied with its blood ſometimes from the arteries of the right ſide, ſometimes through thoſe of the left, according to its inclination during pregnancy; for very generally the fœtus is attached to one ſide, the womb reſts obliquely upon the brim of the pelvis, one ſet of the uterine arteries is more particularly compreſſed, while the others convey the blood freely. The Brain has its four arteries, and often the Carotids have been obſtructed, and the whole blood has run into the brain, through the Vertebral arteries, and circulated backwards towards the face, throat, and jaws, by the inoſculating branches. The Thyroid gland has its four arteries, and when it is diſeaſed, and when we try to cut it out, we find, to our great terror and embarraſſment, the blood pouring, with equal violence, from every artery of the gland; and that while one inoſculation is left, while one arterial mouth is open, it bleeds with more than the violence of a ſingle artery, for it draws its blood from all thoſe which inoſculate with it. When our limbs reſt upon one ſide, the blood runs in another direction: while we graſp, turn, bend, and exert the limbs in various ways, we are perpetually changing the direction of the blood; and though the communications of the arteries are leſs marked in other parts of the body than in the brain, womb, thyroid gland, and round the joints, we have reaſon to believe that ſuch inoſculations are univerſal; that they increaſe the force of the circulation, and are neceſſary to the free motion of the blood; that the blood often runs a retrograde courſe; that theſe frequent inoſculations are eſſential to health, and competent to the ſupplying of the parts, in the accidents of wounds, obſtruction, or diſeaſe *.

If ſurgery could continue to improve, and the books of the preſent day be altogether forgotten, it would not be eaſy to perſuade a ſurgeon of the ninteenth century that amputation was at one time deciſively recommended in all wounds of the great arteries, or that the moſt reſpectable writers, men old in practice, accuſtomed both to adviſe and to operate, oftentimes put up at the head of their moſt in-

* I have ſeen from ſome natural cauſe the artery of the arm obſtructed, from the bending of the arm to ſome point beyond the wriſt; but the artery was cut out by a rude diſſector, and no concluſion could be formed from this ſingular and intereſting fact.

tereſting chapter, the following aphoriſm: " When the brachial or femoral artery is wounded, though the patient ſhould not periſh by the hæmorrhagy, the limb muſt ſoon die for want of nouriſhment!" A ſurgeon is not only vexed with the difficulties of finding or tying a great artery, he is diſtracted with fears and doubts about its ſucceſs. He is warned, " that, in ſuch caſe, the progreſs towards putrefaction will be very ſwift:" " That a wound of this kind very generally requires amputation." All intermiſſion is cut off; not one precious moment is to be waſted in delay; not a moment is allowed for thought; not the ſlighteſt doubt is ſuggeſted in ſo difficult a queſtion. While this rule remains unrefuted (a rule which no ſenſible man will conform to), the young ſurgeon is left in a diſtreſſing ſituation, he hears, indeed, reports of limbs being ſaved, but no otherwiſe than by miracle, he knows that the general rule of ſurgery is to cut them off! Naturally unwilling to perform ſuch an operation, he ſhrinks from it, he performs rather the operation for aneuriſm, but every time he performs it he feels himſelf particularly reſponſible! he feels himſelf anſwerable for his patient's life every time that he refuſes to comply with the common rule of amputating his limb.

There are innumerable accidents, as bruiſes, compound fractures, and gunſhot wounds, in which the limb is ſo hurt, that, if along with theſe injuries the great artery be wounded, (driving its blood deep among the diſordered parts), there is every danger that gangrene will enſue, but not from want of blood! we find inoſculations formed among the firſt branches of the great arterial trunks the moment they have emerged from the trunk of the body, ſuch inoſculations as ſhould preſerve the whole circulating ſyſtem even although the aorta itſelf were interrupted! I know of no part of the body in which the ſimple wound or interruption of the artery, uncombined with other injuries ſhould prove fatal, I would tie the artery of the groin or axilla as confidently as I would tie the artery in the ham, or at the bend of the arm, I hope confidently to ſet up at the end of this diſcourſe an axiom, the reverſe of that which I have juſt mentioned; for I will endeavour to eſtabliſh my concluſion on ſubſtantial proofs, while the old doctrine is, I aſſure you, founded on mere prejudice and groundleſs fear.

When I caſt my eye over the general plan of the arterial ſyſtem, I think I can mark out three chief points, where, by obſerving the connections of the arteries, we ſhall be able to lay ſure grounds for very important concluſions.

Firſt, I am ready to prove to you, that no ſooner do the two great arteries of the axilla and of the groin emerge from the trunk of the body than they eſtabliſh ſufficient connections with each other (diſtant as they are) to enſure the continuance of life even though the aorta itſelf ſhould be interrupted. Secondly, That the two great fleſhy joints of the haunch and ſhoulder are ſo ſurrounded with copious inoſculations as to enſure the life of the extremities, though their arterial trunks were interrupted! and, Thirdly, That the inoſculating arteries, ſurrounding the ſmaller joints of the knee and elbow, are neither more conſpicuous nor more effectual in preſerving the circulation than thoſe of the ſhoulder and haunch, though the ſurgeon has a perfect dependence on the one, and has as yet ſcarcely learnt the importance of the other. You are, I doubt not, prepared to follow me in this inveſtigation, with a degree of intereſt fully equal to the tedioufneſs of the inquiry.

1ſt, When the two great arteries of the arm and of the leg emerge from the trunk of the body, they ſend out each a very remarkable branch! From the ſubclavian artery goes off the internal mammary, which runs along through the thorax under the ſternum, down to the ſcrobiculus cordis. The femoral artery, in like manner, ſends off the epigaſtric artery, which turns backwards under the femoral ligament, runs along under the rectus muſcle, riſes to the ſcrobiculus cordis, and there terminates in inoſculations, with the mammary artery, forming a connection betwixt the two arterial trunks, which has been long remarked. This inoſculation I ſhall preſently prove to you, is ſufficient when the aorta itſelf is interrupted to ſupply the great artery of the thigh with blood.

2dly, The ſubclavian artery, juſt where it turns over the thorax, ſends off ſeveral very remarkable branches. The branches of the thyroid and cervical arteries, long, ſlender, and conſiderable in reſpect of number, turn round the ſhoulder joint, and mix their extreme branches with thoſe branches which come off from the brachial artery; and one branch is of remarkable ſize, the ſupra ſcapularis, which turns over the ſhoulder, enters the notch on the upper border of the ſcapula, and ſupplies much of the fleſh which covers the ſcapula, it inoſculates in a particular manner with the ſubſcapular artery. You have but to tie the axillary artery, and inject wax by the ſubclavian from within the thorax, you will find your wax run freely into the lower part of the brachial artery, and will be ſatisfied that thoſe inoſculations are competent to the ſupport of the limb.

In like manner, is the haunch ſurrounded with many arteries, which hold remarkable inoſculations with the arteries of the thigh. They all turn round the pelvis, juſt as the cervical and humeral arteries turn round the ſcapula; they all inoſculate with the profunda femoris, as the ſupra ſcapular branches inoſculate with thoſe of the humeral artery; the Iſchiadic artery comes out through the Sciatic notch along with the ſciatic nerve; the Thyriod artery comes out through the thyroid hole with the Thyroid nerve; the Pudic artery comes out by the ſide of the bladder to ſupply the parts of generation. All theſe branches have frequent inoſculations with the two uppermoſt branches of the profunda, i. e. with the inner and outer articular arteries which ſurround the hip joint; and theſe inoſculations are either ſo frequent, or ſo wide, that they convey an injection eaſily; if you tie the External Iliac artery, and inject from the Common Iliac, you will find your injection in the femoral artery, although the direct road to it be obſtructed by the ligature. It is almoſt ſufficient that I affirm that thoſe inoſculations permit an injected fluid to paſs through the limb directly, and at one ſtroke of the ſyringe, without that ſlow inſinuation of the blood, and dilatation of the arteries, which facilitates the effect in the living body; but I will moreover prove to you, by the moſt direct inference, that theſe inoſculations are ſufficient to ſave the limb even when the great artery is tied cloſe to the arm-pit or groin, when the femoral artery itſelf is obliterated within the pelvis by diſeaſe, and the whole limb diſordered by the extravaſation of blood.

3dly, Round the joints of the elbow and knee there are well known inoſculations, which have attracted particular notice, becauſe of the frequency of anueriſm in thoſe two points of the arterial ſyſtem. As the brachial artery advances towards the bend of the arm it gives off three arteries, the Profunda Superior, the Profunda Inferior, and the Ramus Anaſtomoticus Major. Theſe three arteries, lying parallel with the main artery, are often named collateral arteries; they are very delicate and ſlender; they twine round the elbow joint, and they inoſculate with three ſmall arteries, which are reflected from the three great branches of the fore-arm. Theſe retrograde twigs are very ſmall; they are named Recurrens Radialis, Recurrens Ulnaris, and Recurrens Interoſſea, the whole apparatus of inoſculating arteries conſiſts of the moſt delicate and almoſt inviſible twigs, it is indeed a fortunate injection that ſhows the communications of thoſe twigs with each other. The elbow joint is naked and bony; the veſſels delicate, long, and ſlender; the injection does not paſs through thoſe inoſculations ſo freely as it

does round the inoſculations of the fleſhier joint of the ſhoulder; theſe veſſels will hardly tranſmit tepid water, and yet they enlarge ſo eaſily, that the main artery may be tied with perfect confidence. The operation for anueriſm has been performed ſome hundreds of times; and, notwithſtanding the apprehenſions of ſurgeons, never has a gangrene occurred from ſuch a cauſe.

In like manner is the knee joint ſurrounded with inoſculating arteries. The popliteal artery, as it approaches the bending of the ham, gives off branches exactly reſembling thoſe of the Humeral artery, and they are met by branches returning from the three great arteries of the leg, viz. from the Anterior tibial, the Poſterior tibial, and the Fibular arteries. Theſe alſo are long, ſlender, delicate arteries, injections penetrate them with difficulty, the artery in the ham being tied, the tibial arteries do not receive an injection thrown into the arteries of the thigh, and yet the articular arteries have ſo often ſaved the limb after the operation for anueriſm in the ham, that when the operation fails, the mortification of the limb is to be attributed to cauſes very different from the want of blood.

The inoſculations of all kinds of veſſels are innumerable and perpetual, but in a practical review of the arterial inoſculations, theſe three are the chief: Firſt, The inoſculations of the axillary and femoral arteries through the epigaſtric and mammary arteries. Secondly, The inoſculations ſurrounding the fleſhy joints of the Shoulder and Hip, viz. the Cervical and the Sciatic arteries; and, Thirdly, The ſlender inoſculations which ſurround the naked joints of the elbow and knee, called the Articular or Inoſculating arteries: I truſt I ſhall be able to prove, that each of theſe has a degree of importance which has not hitherto been attached to it.

## FIRST, OF THE INOSCULATIONS WHICH SUPPLY THE PLACE OF THE AORTA.

The firſt vaſcular connection which falls to be illuſtrated is that of the axillary artery, with the arteries of the thigh: Perhaps there are no two arteries of the body ſo far removed, and yet ſo immediately connected with each other. There is no inoſculation more incapable of dilatation, nor more circuitous than this; and there is nothing in pathology more difficult to believe, than that the blood ſhould paſs by this rout from the ſubclavian to the femoral artery, or that two

ſmall arteries, the mammaries and epigaſtric arteries ſhould ſupply, in any degree, the want of the aorta, yet the fact is proved. " Mr. Paris, diſſector for the amphitheatre of the Hotel Dieu, in the year 1789, injected the body of a very lean old woman, of about fifty years of age, whoſe arterial ſyſtem was found to be ſingularly deranged, and the circle of the blood changed altogether, by a complete contraction of the aorta a little beyond the arch; and Mr. Paris had his attention particularly excited to the condition of this ſubject by the unaccountable enlargement of the ſmall arteries upon the fore part of the cheſt. He had filled the arteries with an injection compoſed of equal parts of ſuet and roſin, coloured with lamp black; and this injection, thrown in from the mouth of the aorta, paſſed along ſo eaſily, that far from ſuſpecting any obſtruction, he felt that he could have thrown in more injection than is uſually required for filling an adult body.

The ſubject was ſo meagre, that, without diſſecting, Mr. Paris felt the thoracic arteries running down the ſides of the cheſt, tortuous, and remarkably enlarged. It was natural for him to be very careful in the diſſection of this ſubject. He found the aorta, immediately beyond its arch, contracted to the ſize of a writing quill! The coats of the artery were of their uſual thickneſs, and its cavity of courſe extremely ſmall; the arch of the aorta above this conſtriction was but very ſlightly dilated, the part below had loſt nothing of its natural ſize. Nothing could be found, either in its own ſtructure, or in the condition of the neighbouring parts, to account for this conſtriction of the artery.

The carotids were natural. The arteria innominata, and the left ſubclavian were enlarged to twice their natural diameter; and all their ſmaller branches had increaſed in the ſame proportion, and had aſſumed a curled and zig-zag courſe. The internal mammary and phrenic arteries were greatly enlarged and very tortuous. The tranſverſe arteries of the neck were of twice their natural ſize. Their poſterior branches were tortuous, extending to a great diſtance over the back, with long inoſculations, which were met from below by the branches of the Upper Intercoſtal arteries, and they were alſo remarkably enlarged; the thoracic and ſcapular arteries, which go along the ſides of the cheſt, were of twice their natural ſize.

Below the conſtricted part of the aorta, the Lower Intercoſtals were remarkably enlarged, even to three or four times their natural ſize; each of them was dilated, but thoſe were moſt affected which came off higheſt and neareſt the

contracted part, and the posterior branch of each, which penetrates to the muscles of the back, was more dilated than that which runs betwixt the ribs: indeed, those posterior branches were so remarkably dilated with contortions so closely succeeding each other, that they resembled a necklace of beads; and their inosculations with the branches of the Transversalis Cervicis were very remarkable. The Lower Phrenic artery was enlarged, holding considerable inosculations with the superior phrenic; and the Epigastric artery was dilated to the size of the enlarged mammary artery, and was joined with it by very numerous and very conspicuous inosculations * !"

The import of this very remarkable dissection you cannot fail to perceive, and I dare say you have been employed in remarking, while I described these dilated branches, the several inosculations, and in matching branch with branch among those enlarged arteries. I need not enter into any minute analysis, of this phenomenon, but some conclusions which the author has neglected I will venture to supply. By this constriction of the aorta, it was divided into two portions, and all its lower parts were deprived of blood. The carotids were not dilated, because they pass on directly to the head, and give no branches which could inosculate with branches from the lower part of this obstructed aorta. The subclavian arteries were remarkably enlarged, because the whole circulation of the body was to depend upon their smallest branches, these small branches were, by their dilation, and by their number, to compensate for the want of any more direct communications betwixt the upper and the lower parts of the aorta! for of the lower aorta, the whole wanted blood from the top of the thorax downwards all through the abdomen; the lower extremities also wanted blood. This blood then was supplied from other sources: It was delivered into the aorta at two points, one set of inosculating arteries opened into the thoracic aorta, and supplied blood for the abdomen, while another set opened into the iliac or femoral artery, and supplied blood to the lower extremities. First, The arteries passing off from the subclavian round the back and shoulders, i. e. the transverse arteries of the neck, and the transverse artery of the shoulder, were of twice their natural size; they extended over the back, and ended in long and tortuous inosculations with the posterior branches of the intercostal arteries, which were dilated and twisted so as to resemble a string of beads; and the upper inter-

* *Vide* Dessault's Journal de Chirurgie, Tom. II. p. 108.

coſtal, which comes off from the ſubclavian artery, within the cheſt, being enlarged, and inoſculating with the lower intercoſtal arteries which come off from the aorta below the third rib (and below the conſtriction), aſſiſted in filling the great trunk of the aorta with blood; which alſo received ſome from the enlargement and mutual inoſculations of the upper and lower diaphragmatic arteries.

The artery of the thigh, on the other hand, was filled with blood, which paſſed from the ſubclavian along the internal mammary artery; this internal mammary was reinforced by inoſculations with the thoracic or external mammary arteries, while the blood of both mammary arteries poured into the femoral artery through the Epigaſtric. The blood in moſt parts of the body was retrograde; the ſmalleſt arteries of the body, the moſt ſlender, thoſe of the moſt delicate inoſculations, were made to ſtand in place of the aorta itſelf. The blood reached the trunk of the aorta through long and ſmall arteries, twining in a tortuous form round the back and ſhoulders! The blood of the femoral artery reached it from the ſubclavian, by the long and ſlender inoſculations of the mammary and epigaſtric, running directly down the fore part of the belly. "The part of the aorta immediately above the conſtriction was ſcarcely dilated. The part below had loſt nothing of its natural ſize." The preſſure then had fallen very light upon the conſtricted part of the aorta, no dilatation, nor the ſlighteſt appearance of aneuriſm, had been produced by the action and preſſure of the heart, forcing the blood through this ſtricture, none but the ſmalleſt arteries, thoſe fartheſt removed from the force of the heart, had dilated, rather by the demand of blood upon them, and by their own increaſed action, than by the vis a tergo. It would thus appear that the ſtroke of the heart, is not eſſential to the reaction of the arterial ſyſtem! That if arteries be but filled, they will be excited, and will, by their own muſcular power, propel their blood.

Nor need we wonder at this complete obliteration of the canal of the aorta; it is not without a parallel in the other important veſſels of the body; thoſe even on which life and nouriſhment moſt immediately depend. My friend, Dr. Bailly, found the Vena Cava obliterated from the kidney to the diaphragm, it was cloſed at that very place where it ſhould immediately diſcharge the whole congregated blood of the lower extremities and pelvis into the heart. So entirely was the cava obſtructed that air could not paſs. The blood went by a very circuitous rout; the emulgent vein was dilated; the ſmall lumbar veins were enlarged;

the thoracic veins, and eſpecially the vena azygos, were diſtended ſo as to receive all the blood of the lower cava. That blood which ſhould have paſſed in under the liver, aſcended to the ſubclavian vein; and the lower cava was repreſented by the ſmall thoracic veins and vena azygos, juſt as the aorta, in the caſe I have now related, was repreſented by the ſmall intercoſtal arteries.

The Thoracic Duct itſelf is often obliterated; the main duct is obſtructed by tumors of the abſorbent glands, or diſeaſes of its valves; the adjoining abſorbents dilate, ſo as to repreſent the proper thoracic duct; and indeed the long abſorbent, which, running along by the left ſide of the aorta, carries, in ſuch caſes, all the abſorbed fluids, is ſo peculiar in its form, place, and circumſtances *, that I am almoſt perſuaded the thoracic duct is double! that the abſorbents of the loins, by which we inject, lead more directly to the greater branch of the duct on the right ſide, is the reaſon why it alone is known as the channel by which the chyle and lymph are carried into the circulating ſyſtem, while obſtruction from diſeaſe, or the application (while we are throwing in the injection) of a ligature round the root of the great thoracic duct, is neceſſary to point out to us the branch which lies along the left ſide of the aorta.

We perceive, then, that there are formed, even in the trunks of theſe great veſſels, ſuch inoſculations as enſure the continuance of life, when the Thoracic Duct, the Vena Cava, the Aorta itſelf, are ſtopped up. Nature, even in theſe deſperate emergencies, has provided againſt that gangrene, and death, which narrow ſighted phyſiologiſts have ventured to prognoſticate, where only the leſſer arteries of the limbs are interrupted. We can have no doubt of the perfect power of the inoſculating veſſels in all other parts of the body, but we take particular pleaſure in inveſtigating the effect of the inoſculations which ſurround the great joints of the ſhoulder and haunch, becauſe the inveſtigation is itſelf one continued review of many important cures and operations, and each concluſion is of the higheſt importance in practical ſurgery.

* Mr. Aſtley Cooper has publiſhed, in the Medical Records of London, a very neat, ſhort, and well compoſed paper, on the obſtruction of the thoracic duct, accompanied with a drawing, and with many very ingenious obſervations, which lead me ſtrongly to ſuſpect that this long lymphatic is more important than is imagined; that the thoracic duct is abſolutely double.

## SECONDLY, OF THE INOSCULATIONS WHICH SUPPLY THE PLACE OF THE FEMORAL ARTERY.

Surgery and anatomy, which ſhould go hand in hand, have not only been ſeldom combined, but have actually been the ſeparate ſtudies of two diſtinct ſets of men. Phyſicians, and profeſſed anatomiſts, have written in their cloſets, conjectures and cautions, and ſchemes of operations! while ſurgeons, far from being able to compare thoſe conjectures with the truth of their own art, have humbly received them as abſolute rules. Unleſs from mere caprice, or the hopes of ſaying ſomething ingenious, phyſicians have been at little pains to ſtudy the common operations. But when a queſtion preſents itſelf of ſuch high importance as this, "What are the branches which ſave the limb when its main artery is tied?" We ſhould hope to find a point ſo eaſy of ſolution, very early ſtudied and explained, and yet no one artery has been thoroughly ſtudied, nor has any one ſet of inoſculating arteries been truly inveſtigated! The greateſt anatomiſts have written on theſe ſubjects with unaccountable indifference and careleſſneſs: They knew not that the femoral artery divided in the middle of the thigh: They knew the arteria profunda femoris only as an accidental artery: They deſcribed it as a luſus naturæ, and made their experiments and diſſections, not on the bodies of men, but on horſes and dogs!

The celebrated Veſalius hardly knew the profunda; we ſee it indeed in his plate; but we obſerve it only becauſe we know the artery, and the importance which it now has in the eye of the modern ſurgeon; for though it is marked ($\psi \cdot \chi \cdot$), and is repreſented in his plate inoſculating ſlightly with the arteries of the pelvis, it is not drawn truly, nor well explained *. This plan or drawing of Veſalius, though more elegantly engraved, is leſs true and accurate than that of Euſtachius; for in the Tabula XV. of Euſtachius we find the profunda diſtinctly marked, but yet it is not characterized with any of thoſe inoſculations which give it its chief importance in the eye of the ſurgeon; it is not even ſo fully drawn as to attract the notice of the careful Albinus, who, in his explanation of Euſtachius's Tables,

* Veſalius, however, obſerves, and marks one very large anaſtomoſis of the profunda with the thyroid artery. Vid. Integra totius magnæ arteriæ delineatio.

has paſſed over this artery in ſilence, while he ſhould have marked T. fig. 15. as the great arteria and vena profunda femoris, going down together into the fleſh of the thigh. In Verhein this great artery is repreſented in its true proportion to the arterial trunk; but it appears in his plan as one long and ſimple branch, not having that importance nor thoſe wide inoſculations which conſtitute its chief character.

Heiſter comes after all theſe anatomiſts, and being himſelf an anatomiſt and a practical ſurgeon, we ſhould have expected from him, better things. He blames all former authors, Verhein excepted, for having neglected this important branch, "which after all, ſays he, is not ſo very rare †." This one expreſſion ſhows how poorly he underſtood what he ventured to criticiſe. He regards the artery always as a variety, as a mere accident: He compares this double artery of the thigh with the accidental diviſion of the humeral artery above the bend of the arm; and that we may not miſtake his illuſtration, he draws upon the ſame plate, with a wounded femoral artery, a high diviſion of the arteries of the arm.

It may be ſaid truly that all former authors knew this artery; Heiſter alone did not know it, nor had he at all profited by the diſcoveries of thoſe whom he ventured to criticiſe. Veſalius, Euſtachius, Verhein, Cowper, all drew this artery, ſome with more, and ſome with leſs accuracy; and their drawings being deſigned as general plans of the arterial ſyſtem, it muſt be preſumed that they regarded this as a conſtant and regular artery, while Heiſter alone ſpeaks of it as an accidental artery! he mentions it as an accident peculiarly fortunate, when along with a wound of the main trunk there chances to be a double artery in the thigh. Yet Heiſter did not voluntarily take upon him to inveſtigate this artery merely as a matter of ſpeculation, the queſtion was obtruded upon him as of the higheſt importance in practice. A ſhoemaker having dropped his paring knife from betwixt his teeth, clapped his knees together to catch it, and ſtruck the point of the

† "Huic tanto magis miror, quod multi magni anatomici nullum prorſus mentionem fecerint; cum tamen non ſit adeo rarus," p. 142. "Fere omnes anatomici, Verheyeneo excepto, unicum tantum truncum et arteriæ cruralis et brachialis delinearunt, ut videre eſt in Euſtachii, Veſalii, imo et in recentioribus præſtantiſſimis anatomicis, Cowpero ſcilicet," p. 149. Let any man, who knows how the profunda ſhould be drawn look to Cowper's third Table in his Appendix to Bidloo, and he will there find the drawing of the profunda, marked 70, nearly perfect, at leaſt as good and as diſtinct as any other artery in his great plan of the aorta, and more correct than Verhein's Thus much ſhould be ſaid in favour of our great Engliſh ſurgeon, who has ſuffered enough from accuſations. Vid. Gulielmus Cowper, citatus coram tribunale Nobiliſſ. Ampliſſ. Societatis Britann. Regnæ.

knife into the femoral artery. Heiſter reſolutely undertook the cure by compreſſion, neglecting the old rule of ſurgery, which directs that every limb wounded in its great artery ſhould be cut off. He undertook the cure only upon the preſumption that there might perhaps be in this man a double artery: He delivers his opinion of the caſe in theſe terms: "If there be only one arterial trunk in this thigh, as often happens, then neither compreſſion, nor ligature, nor any thing but amputation, can ſave the patient's life, the limb uſually falls into abſolute gangrene *. Heiſter reſolved in this caſe, firſt, to try what could be done by compreſs and bandage, as if he had believed it poſſible to heal the artery; whereas, compreſſion, whenever it ſuppreſſes bleeding, muſt do ſo by obliterating the cavity of the bleeding artery! Next he adviſes, if the compreſs do not ſuffice, to open up the wound, and tie the artery; and, as if the tying of the artery obliterated the trunk more fairly than the compreſs! he adds, "But if, having tied the artery, there ſhould chance to be but one great trunk; (Imo, ſi forte non niſi unicus arteriæ truncus adeſſet) the leg muſt be cut off, otherwiſe it will mortify, and the patient die."

Heiſter not only explains himſelf thus upon an occaſion, in which he was particularly intereſted, in underſtanding the femoral artery thoroughly; but he adds to this practical caveat, and to his undigeſted criticiſms of Veſalius, Euſtachius, and Cowper, a hiſtory of the femoral artery, worſe in all reſpects than that of any anatomiſt who had gone before him; for he ſays, "The crural or femoral artery moſt commonly deſcends through the whole thigh, quite to the knee, in one ſingle trunk, ſending out only very trifling branches to the great muſcles of the thigh to nouriſh them:" "But nevertheleſs it does ſometimes divide in the upper part of the thigh into two great arteries †." That there might be one great trunk only was the chief apprehenſion of Heiſter, when in truth it would be as difficult to find a thigh wanting a profunda, as wanting a femoral artery.

But this miſtake of Heiſter did not end with himſelf; there is another ſur-

* Imo, ſi forte non niſi unicus arteriæ cruralis truncus hoc in femore adeſſet; ſicut ſæpe obſervari ſolet, ſubinde ne ligatura quidem arteriæ læſæ ad ſanandum hoc malum ſufficeret, quia tunc partes infra ligaturam poſitæ, ob ſanguinis arterioſi hac ipſa ſublatum influxum ſphacelo corripi ſolent, ita ut æger tunc ſine ablato crure ſummoque vitæ diſcrimine ſervari non poſſit.

† "Deſcendit arteria cruralis ſeu femoralis unico tantum plerumque trunco, per femur totum uſque infra genu, et utplurimum tantum minores ramulos ad muſculos vicinos prægrandes nutriendos ſpargit," p. 141. "Interea tamen ſubinde in ſuprema fæmoris parte, in duos magnos quaſi truncos ſe dividit," p. 142.

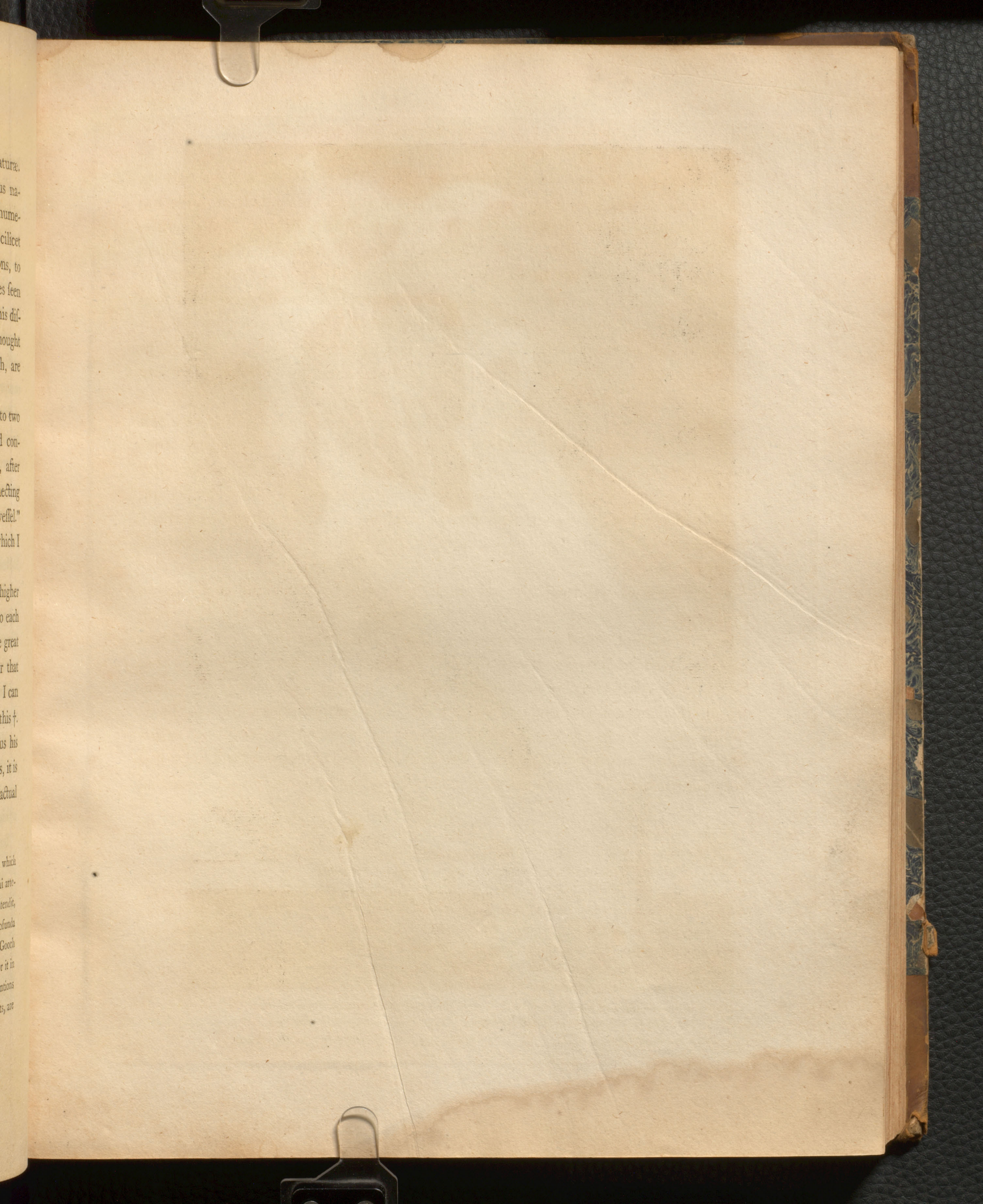
geon of the preſent day who is guilty of calling the profunda a luſus naturæ. Mr. Gooch miſtakes this profunda, calls it an accidental branch, a luſus naturæ. He deſcribes it as an accident ſimilar to the high forking of the humeral artery; he does not indeed clench it with Heiſter's direct affirmation, "Scilicet ſæpe obſervari ſolet;" but he writes a paper in the Philoſophical Tranſactions, to inform the world of this intereſting diſcovery, that he had three ſeveral times ſeen a double artery in the thigh. The terms in which Mr. Gooch deſcribes this diſcovery, which he made while performing an amputation, and which he thought might turn out ſo intereſting in conſultations about aneuriſms of the thigh, are theſe:

"In this amputation we obſerved a diviſion of the femoral artery into two trunks of equal ſize running parallel; and ſo near together as that we could conveniently include them in one ligature with the needle, avoiding the nerve, after raiſing them up with the diſſecting forceps by a ſmall portion of the connecting cellular membrane; and here we found no occaſion to take up any other veſſel." "This makes (ſays Mr. Gooch) the third inſtance of this luſus naturæ which I have obſerved*."

His amputation was particular only in this, that he had cut the thigh higher than uſual. "The two great trunks lying parallel, and equal in ſize to each other," were the femoral artery and the profunda, and where he tied in one great ligature, both the femoral artery and the profunda, there was no wonder that he found no other bleeding arteries. Theſe are the only peculiarities that I can ſee in this amputation, and I dare ſay his other amputations were like this †. When ſuch an author proceeds, in the next part of his paper, to retail to us his experiments ("made with the help of a famous farrier"), upon horſes and dogs, it is very allowable to ſay, that ſuch experiments were but a poor ſubſtitute for actual

* Vid. Philoſophical Tranſactions 1775.

† The celebrated Profeſſor Murray ſays, "I never could find this ſame double artery in the thigh, which Gooch pretends to have found three times, and believes to occur very often." "Nec unquam mihi arteriam femoralem ſuperficialem duplicam videre licuit, qualem celeber. Gooch ſe ter obſervaſſe contendit, &c." p. 44. No wonder that Murray never found any ſuch thing, for Murray knew what the profunda was, and perhaps was not ſo well acquainted with the Engliſh language as to underſtand that Mr. Gooch was calling the arteria profunda, a luſus naturæ, a double femoral artery, &c. was looking out for it in horſes and dogs. That Gooch did not know the profunda, is plain from this, that he never once mentions it in his Surgery, nor in his Royal Society paper. Mr. Gooch's opinion, and indeed his experiments, are repeated in that edition of his Surgery, which was publiſhed in 1792.



C.Bell, delin.

D. Lizars. Sculp.

*a. The Arteria Iliaca Communis.*
*b. The Arteria Hypogastrica in the Pelvis.*
*c. The Femoral Artery.*
*d. The Arteria Profunda Femoris*
*e. The Arteria Articularis Externa.*
*f. The Cutaneous Veins lying by the Artery*

diſſections of the human body. And when ſurgeons ſeven years ago could venture to tie the femoral artery ſupported by no better hopes than this, we (knowing the profunda, and all its connections with other veſſels) may be very bold in tying the artery freely, not only in the thigh, but even in the groin.

From this hiſtory then we may learn, that, till very lately, the lateral arteries of the ham were the only inoſculating arteries known to the ſurgeon; they were remarkable by their enlargement in popliteal aneuriſm; they were obtruded, as it were, upon the notice of the ſurgeon, who knew of no inoſculations any where higher in the limb. At laſt the profunda was remarked; how imperfectly it was underſtood, the foregoing hiſtory will explain, but inoſculations were ſuppoſed to exiſt betwixt that artery and the artery of the ham; and upon this preſumption merely, without any aſſurance of ſuch inoſculations, the ſurgeon ventured at laſt to tie the femoral artery in the middle of the thigh, but he would not for the world have ventured to tie it above that point where the profunda is given off! Will it be believed that men wounded in the upper part of the thigh, and borne off alive from the field of battle, have been ſuffered to bleed to death from the mere apprehenſion of gangrene! as if this formidable gangrene would not have been as ſure a conſequence of the artery being wounded, and pouring out blood, as of its being ſafely tied up! better not reaſon at all than reaſon ſo imperfectly; better almoſt to be ignorant of anatomy than know ſo little; better truſt to the mere impulſe of humanity, which would prompt us to ſtop the effuſion of blood, and to ſave the life in the firſt inſtance, let what would befal us afterwards.

I will now proceed to lay before you a true hiſtory of the femoral artery, ſuch as will entitle me to that broad concluſion which I have claimed, viz. "That there is no part of the body which is not endowed with inoſculations ſufficient to ſave it from all danger of gangrene when the trunk of the artery is obſtructed *."

* The drawings of the femoral artery will be very intereſting to thoſe who are at the pains to read this ſketch of the anatomy of it, and to the practical ſurgeon it will be peculiarly deſirable. He will learn from number firſt, the place of the femoral artery; the expreſs point at which it gives off the profunda; the courſe it takes in running down the thigh; its relation to the ſartorius muſcle, and he will remark the forms of the muſcles of the thigh; he will recogniſe the line of the rectus at (g); at (h) he will remark the fleſhieſt part of the vaſtus internus; at (k) he will remark the fleſhy belly of the great muſcle, the triceps, and he will be careful to remember that at (i), that is above the belly of the vaſtus internus, the femoral artery perforates the thigh, gets into the ham, and aſſumes the name of popliteal artery.

I deſired one of my pupils (Mr. Mochler, a very diligent and ſenſible young man) to cut up a thigh, ſo that I might make a ſurgical piece of anatomy, and draw from it a general view of the femoral artery, and explain its relation to the thigh, and next to cut me out the injected artery of the ſame thigh, ſo that I might

The great artery, the Aorta, deſcends along the ſpine, and near the top of the pelvis, forks into the two iliac arteries, which are deſtined for the lower extremities; and each of theſe common iliac arteries, having paſſed downwards into the pelvis, is again divided into two arteries, the internal iliac, or hypogaſtric artery, which diſtributes its branches to the contents of the pelvis, (ſupplying alſo the great muſcles of the hip, and the upper part of the thigh), and the external iliac, or great femoral artery, which runs down along the thigh.

The Internal Iliac, or, as it is often named, the Hypogaſtric Artery, gives branches to the rectum, vagina, and womb, and, in man, to the urinary bladder and proſtate gland; it gives arteries to the bones of the pelvis itſelf, and moſt eſpecially to the os ſacrum; but its greateſt branches are four muſcular arteries which paſs out through the ſeveral openings of the pelvis to the muſcles of the hip, thigh, and pudenda. They turn round the os innominatum much in the ſame manner that thoſe ſcapular arteries which nouriſh the fleſh of the ſhoulder turn round the ſcapula. The Glutæal Artery, the largeſt, turns round the haunch bone backwards and upwards; it ſerves the glutæal muſcles: the Iſchiadic Artery turns round the os iſchium, and its branches turn downwards towards the hip: the Thyroid Artery is one which paſſes directly forward through the thyroid hole in the fore part of the pelvis; it is ſmaller than theſe; but it plunges into the very centre (as we may expreſs it) of the thigh; it runs in among the heads of the triceps, pectineus and rectus muſcles; it is in the centre of the thickeſt and fleſhieſt part of the thigh; it is alſo cloſe upon the joint of the thigh bone with the os innominatum: the Pudic Artery is the fourth; it is ſo named from its being appropriated to the parts of generation; its main branch goes to the root of the Penis, while its muſcular and largeſt branches paſs out by the ſide of the Bulb of the urethra, and ſcatter upon the perinæum, holding but a ſlight connection with the arteries of the thigh. Theſe are the chief branches of the Internal Iliac Artery; they entirely encircle the fleſhy joint of the hip, and they form many and powerful inoſculations with the upper arteries of the thigh.

The External Iliac, which divides from the hypogaſtric at the ſide of the os ſacrum, turns along the ſide of the pelvis, and emerges from the belly by paſſing under the crural arch; it then ſends the epigaſtric artery upwards along the muſcles of the belly, and the Iliaca Reflexa, a ſmall reflected artery backwards a-

draw a tree of the artery, ſuch as would repreſent the great ſubdiviſions of the artery, and the general tendency of its inoſculating branches.

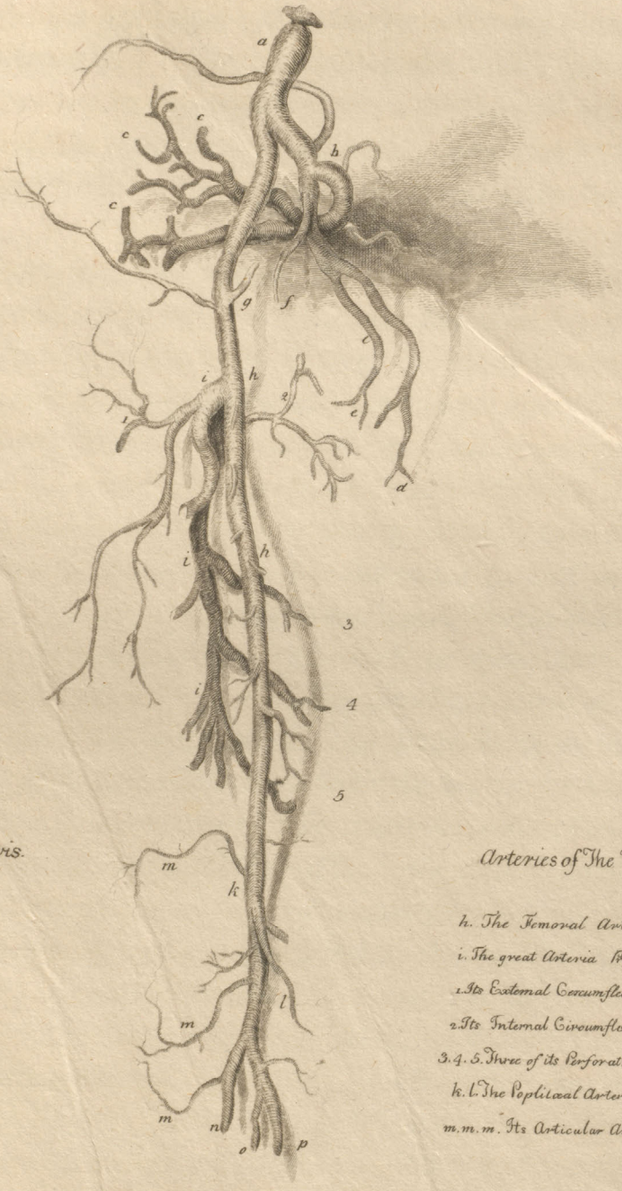
long the border of the os ilium. The femoral artery then bends downwards from the groin along the inner ſide of the thigh, and near the groin at the top of the thigh, about five inches under the crural ligament it divides into two great arteries, equal almoſt in ſize, the one appropriated to the thigh and the other deſtined for the leg. The artery which is deſtined for the leg paſſes almoſt ſuperficially along the fore part of the thigh, while that branch which belongs to the thigh itſelf plunges immediately into the thick fleſh of the thigh; it ſpreads its branches to the very centre of the thigh, whence it is named Profunda Femoris; it is appropriated to the great muſcles of the thigh, whence it was known among the older anatomiſts by the name of Muſcular Artery of the Thigh; in ſize it equals the trunk of the artery, and is more widely diſtributed than any other artery of the body. Its trunk, where it comes off from the femoral artery, is thick and ſhort, and its branches ſpread upwards towards the hip joint, or downwards towards the back part of the thigh. Two large branches turn ſuddenly upwards, they ſurround the hip joint by twining round it in all directions, they are large at this root, but ſoon ſpread into innumerable ſmall twigs, their inoſculations with the arteries which come out from the pelvis are very frequent; theſe two branches, from their ſurrounding the inner and outer ſides of the joint, are named the External and Internal Circumflex Arteries. The profunda, as it works its way downwards among the muſcles of the thigh, divides (from ſtep to ſtep as it goes down from muſcle to muſcle) into three or four great branches; theſe paſs through the triceps from the fore to the back part of the thigh, whence they are named the Four Perforating Arteries; and theſe in their turn inoſculate downwards with the articular arteries of the knee joint.

The main trunk of the artery, that which is uſually named the Femoral Artery, having ſent off this great branch, which ſupplies the muſcles, runs obliquely downwards along the inner ſide of the limb, ſuperficial or almoſt ſo, lying only under the ſkin and the ſtrong faſcia of the thigh; it winds obliquely along the thigh in the exact courſe of the ſartorius muſcle; it penetrates about two-thirds down the thigh through the tendon of the Triceps muſcle, and ſo paſſes from the fore part of the thigh into the cavity of the ham; it is ſimple, and unconnected with muſcles; it gives no branches of any importance where it lies along the thigh; it ſends off only ſmall cutaneous and muſcular twigs. When the femoral artery paſſes through the triceps, and arrives in the ham, it gives five long ſlender arteries to

the knee joint, they are of the ſize of crows quills; they encircle the joint in every direction; three go off a little above the joint and three below, whence they are named the Upper and Lower Articular Arteries; they are named Collateral Arteries ſometimes, and often Inoſculating Arteries; they belong almoſt excluſively to the tendons, capſule, and burſæ of the joint, while ſome of their branches enter into its cavity to ſupply the ligaments and fat. But the femoral artery, unexhauſted by theſe cutaneous twigs or articular branches, arrives at the top of the leg; lies cloſe to the joint; attaches itſelf to the bones as if for ſupport and ſafety; it divides a little below the gartering-places into three great branches, named Tibial and Fibular Arteries; and theſe, like the Radial, Ulnar, and Interroſſeous arteries, run downwards along the bones.

Theſe are the three arteries of the pelvis of the thigh, and of the leg; and, when you caſt your eye upon the plan, theſe things will ſtrike you! That the glutæal, ſciadic, and pudic arteries, which ſurround the pelvis, and ſcatter ſuch a profuſion of branches in all directions, reſemble thoſe which ſurround the ſcapula. That the main artery of the limb, ſince it lies almoſt ſuperficial along the fore part of the thigh, runs down unexhauſted to the ham, and there divides into the three arteries which nouriſh the leg! ſhould be named, not the Femoral, but the Crural Artery; while the Profunda, a deeper artery, ſince it goes ſolely to the muſcles, is the proper artery of the thigh. That this arteria profunda being as big as the femoral artery, having numerous branches, which run upwards towards the hip joint, and downwards towards the knee, muſt have large inoſculations, whence we may be aſſured, that if it can draw blood from above it will eaſily tranſmit it to the lower parts of the limb; in ſhort, that ſo great an artery muſt be quite competent to the nouriſhment of the thigh, although the main trunk were interrupted. The profunda lies as a great inoſculating trunk betwixt the arteries of the pelvis and the arteries of the ham; its firſt branches turn upwards to meet thoſe from within the pelvis, its lower branches turn downwards to meet the articular arteries of the knee, although it be the proper office of this great artery to nouriſh the thigh, yet one accidental, but very important office, is to inoſculate with other arteries. It is thus by theſe conjoined offices that the economy of the limb is perfect; that it is nouriſhed during health, and ſupported by new circles of blood when any accident affects the main artery.

This ſucceſſion of inoſculations all along the limb muſt appear very intereſting to you; thoſe which are formed in the ham by the articular arteries have been




Arteries of the Pelvis.

a. The Common Iliac.
b. The Hypogastric.
c.c. The Glutæal.
d. The Ischiatic.
e. The Pudic.
f. The Thyroid.
g The Epigastric.

Arteries of The Thigh.

h. The Femoral Artery.
i. The great Arteria Profunda.
1. Its External Circumflex Artery.
2. Its Internal Circumflex Artery.
3. 4. 5. Three of its Perforating Arteries.
k. l. The Popliteal Artery.
m. m. m. Its Articular Arteries.

n. o. p. The three Arteries of the Leg.

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long remarked, becauſe they are enlarged in popliteal aneuriſm and ſave the limb; yet they are in their natural ſtate too delicate to receive water, or to allow it to paſs eaſily. Thoſe which ſurround the hip joint, formed by the upper branches of the profunda with the arteries from within the pelvis, are more numerous, in proportion as the joint is fleſhier and larger; they receive eaſily injections of wax while we can hardly force water into thoſe ſurrounding the knee; yet they have never been obſerved, nor has any ſurgeon ventured to tie the femoral artery above the profunda; as if the profunda were a particular veſſel, appointed by nature in a certain part of the limb to facilitate the ſurgeon's operations when he choſe to perform them!

The ſucceſſion of inoſculations is ſo perfect, that were the main artery obſtructed even within the pelvis, or at the groin, innumerable branches of the ſciatic and thyroid arteries would pour the blood through the upper branches of the profunda, and from the mouth of the profunda into the femoral artery! Were the femoral artery obſtructed in the thigh, the trunk of the profunda would convey the blood freely, the numerous branches of the profunda would diſtribute that blood for the nouriſhment of the thigh; and ſome inoſculating branches enlarging more than the others, would carry the blood round the obſtructed part of the artery, and convey it with a full ſtream into the artery at the ham! Should both the profunda and the femoral artery be abridged, or obſtructed, or quite deſtroyed, the long and ſlender branches of thoſe arteries receiving the whole blood of their parent trunks, would enter into a powerful action, and dilate ſo as to convey the blood effectually along the back part of the limb from the hip to the ham! That ſuch long and ſlender arteries ſhould become effectual arterial trunks, ſhould repreſent the main artery, and convey the whole blood of the limb, muſt ſeem incredible, till I ſhall have produced the proofs, every one of which is in itſelf important.

The theorem, then, which I have now to prove is this, that not the femoral artery only may be ſafely tied in the middle of the thigh, but that the femoral artery, the profunda, and even the iliac artery within the pelvis, may all be obliterated without the limb falling into gangrene. This muſt be eſtabliſhed, not by alleging probable conſequences, but by plain facts; and I enter the more willingly on this proof, becauſe it includes, *a fortiori*, the true doctrine of wounds in all the lower parts of the limb.

"Guattani was called to a man of thirty years of age, who lay ill in bed with an aneuriſm of the groin, accompanied with fever, which proceeded merely from the

excruciating pain. The tumor was close upon the fallopian ligament, hard, firm, of the size of a large quince, colourless, but with an intense pulsation; and the whole limb was distended almost to bursting."

"Guattani had expected to cure even this aneurism by gentle compression. He was indeed at one time flattered with hopes of success: the fever had subsided; the pain had ceased; there was a sensible lessening of the tumor, so that he found it necessary to draw his rollers closer from day to day; for a whole month did he indulge the hope of accomplishing the cure. But while the tumor seemed thus yielding to the compression, it burst during the night, with intense pain, and the attendants were obliged instantly to cut the bandages and give the patient relief. Then the blood rushing forwards among the cellular substance, which surrounds the psoas muscle, produced so sudden an enlargement of the tumor, that Guattani, at the next visit, perceived that all hopes of a cure were at an end; bandages could no longer be applied; no endeavours to appease the pain, or restrain the tumor, were of the smallest service; from day to day the tumor extended; it came plainly from within the pelvis; it filled the whole Hypochondrium, extended along the groin, and reached the middle of the thigh: with this prodigious tumor, hard, firm, pulsating strongly, and filling the haunch both within and without! the man lingered four weeks and then expired."

The conclusion which I am to draw from this interesting case is not undisputed. The celebrated Murray will not allow that the bursting of the artery implied a total change in the current of the blood. "Although (says Murray), Guattani was able to push an injection of tepid water, tinged with yellow, from the glutæal artery round into the trunk of the femoral artery, yet do I suspect strongly, that the grosser fluid, the blood, would pass through the same channels more difficultly; nay, so sparingly, as not to nourish the limb." But I will relieve you from all doubts by explaining the state of the parts. Twenty-four hours after death the body was dissected. Upon opening the abdomen, the coagulated blood was found to extend upwards along the whole bed of the psoas muscle, and downwards nearly to the middle of the thigh. This blood being removed, the iliac artery was found torn where it runs along the edge of the os innominatum. The laceration was four inches in length; was on that side of the artery which lies upon the os ilium; began about an inch below the giving off of the internal hypogastric artery, and terminated near the ligament of the groin. The blood had escaped from the back part of the artery, it had been injected under the back

part of the muſcles, and among the cellular ſubſtance, which belongs to the perioſteum of the bones. The artery was raiſed up from its bed of cellular ſubſtance by this extravaſation, and preſſed ſtrongly forwards, not only againſt the peritoneum, but againſt the muſcles and ſkin, and was wonderfully flattened, ſo as to prevent its conveying any blood to the limb. The bones were carious and ſpinous; the capſule of the hip joint was deſtroyed; and the head of the thigh bone was entirely diſplaced.

This diſorder and deſtruction of parts induced Guattani to inveſtigate the whole courſe of the femoral artery, which he ſeems to have traced very carefully from the groin to the ham. He began his diſſection where the laceration ended, viz. near the ligament of the thigh. He made from that point a longitudinal ſection of the artery, and found its caliber ſomewhat below its natural ſize, decreaſing gradually as it proceeded down the thigh. Where the artery approached the ham he thought that it abſolutely cloſed; but, upon examining carefully, he found it could ſtill admit one of Anell's wires, though with difficulty. It enlarged again to its natural diameter when it had entered into the cavity of the ham *.

The circumſtances of this caſe and diſſection are, I think, deciſive of this im-

* "Tranſactis horis viginti quatuor, accedere conſultum duximus ad inſpiciendum, rimandumque aneuryſma; quamobrem, aperto imo ventre, tanta ſe nobis objecit concreti ſanguinis copia, ut hæc ſuperius per totam Pſoas muſculi longitudinem, inferius autem pene ad dimidium femur protenderetur. Omni igitur coagulato ſanguine educto, cultroque anatomico communis ilacæ arteriæ directionem ſequentes, interna vix pollicem tranſverſum tranſacta iliaca, invenimus in externa rupturam aneuryſmaticam, quæ ſpatio quatuor digitorum tranſverſorum extendebatur verſus ligamentum Falloppii, ubi ipſa arteria nomen cruralis acquirit."

"Quarto, hinc pariter factum eſſe, ut ſanguis, ſub ipſa arteria per totam ipſius longitudinem ſibi viam patefaciens, Falloppii ligamentum tranſierit, femoris pene dimidium obſederit, hujuſque articuli ita capſulam lacerarit, ut femur inde luxatum fuerit; factumque demum fuiſſe, ut ipſa arteria, a concreto ſanguine antrorſum ſublata, et compreſſa fuerit adverſus Peritoneum, adverſus muſculos, ipſamque cutem, atque ita quidem, ut cylindrica ſua naturali figura orbata, mirumque in modum depreſſa impar evaſerit ad ſanguinem verſus articulum afferendum."

"Ejuſmodi caſus in me cupiditatem maximam excitavit conſiderandi totius cruralis arteriæ tractum. Eapropter incipiens ego ubi aneuryſmatica diſruptio finem habebat, ibidemque ſectionem longitudinalem inſtituens, arteriæ cavum jam ſolito minus eſſe conſpexi, quumque hoc magis, magiſque poplitem verſus extenuaretur, mihi penitus occluſum, antequam ad illum accederet, viſum fuit. Sed re accuratius inſpecta, cognovi, tantum in arteria cavi relictum eſſe," &c.

"Popliteæ hujuſce arteriæ anguſtatio evidentiſſime mihi videtur evincere, cruralem arteriam, ob compreſſionem in aneuryſmatis loco a coagulato ſanguine factam, non amplius ex iliaca externa recipere potuiſſe ſanguinem, ut illum ad articulum ferret; ſecus enim poplitea non valuiſſet unquam ita reſtringi."

portant point. The artery thus conſtricted, ſtraitened to ſuch a degree that it could ſcarcely admit one of Anell's wires for ſearching the lachrymal ducts (a wire no bigger than a briſtle) could ſurely tranſmit no blood, and was in no reſpect equal to the nouriſhment of the thigh. Had the continued trunk of the artery been capable of conveying blood, the burſting of the artery within the pelvis muſt have deprived it of all chance or poſſibility of receiving blood. Had this artery been entire in its upper part, and pervious below, ſo as to receive and tranſmit the blood eaſily, ſtill it was in its middle ſo raiſed and ſtretched over the extravaſated clots, as to prevent, to uſe Guattani's own words, one drop of blood paſſing along to the lower parts of the limb; not only the main artery was thus burſt, diſtorted, and ſtraitened, but all the collateral arteries muſt have been obliterated. The femoral artery ſeems to have eſcaped total eroſion, becauſe it was raiſed over the extravaſated blood, and preſſed cloſe to the ſkin; but how could the profunda, the deep, muſcular, and articular artery of the thigh eſcape, when the muſcles themſelves were diſordered, the capſular ligament deſtroyed, the head of the thigh bone diſplaced, and all the bones carious? The injection of yellow water, of which Murray ſpeaks ſlightingly, as a doubtful experiment, is abſolutely deciſive; for though yellow water may be forced from the hypogaſtric artery through the natural inoſculations, into the femoral artery, yet, it will not paſs through two ſucceſſive ſeries of inoſculating arteries. Where both the femoral artery in the groin, and the popliteal artery in the ham are tied, tepid water when injected has to work its way through ſucceſſive ſets of inoſculations, and exudes into the lower arteries very ſparingly! But in this caſe, water thus injected, flowed eaſily into the arteries below the ham, while we perceive, by the experiment which I have quoted below, with how much difficulty the injected water finds this paſſage in the natural ſtate of the arteries, and how wide the difference is betwixt the condition of an aneuriſmal limb and of a ſound one.

Murray's difficulties are anſwered in one word: Not this yellow injection only, but the blood itſelf, actually moved through the inoſculating arteries; the man lived ſeveral weeks after the artery had burſt*!

* Guattani does not mark the difference betwixt his experiment and his diſſection; but his experiment was this: Firſt, he placed his injecting tube above the hypogaſtric artery, then he tied the femoral artery in the groin, and threw in his injection, and it went round eaſily into the profunda femoris; which he explains by ſaying, "More ſatis copioſo perfluxit." Next, he made another ligature upon the great artery in the ham, imitating the obſtruction in this caſe of aneuriſm, and he forced the injection round in a ſecond

This is the moſt ſinglar fact in the whole pathology of aneuriſms; for the blood which had nouriſhed this limb had moved not only through the common inoſculations round the hip joint, but it had gone by the moſt circuitous courſe. To finiſh its circle, the blood muſt have paſſed through three ſeries of inoſculating veſſels, thus! the blood came not from the upper inoſculations of the profunda into the trunk of the profunda, and ſo round the haunch by a ſhort circle, into the great artery of the thigh, but muſt have proceeded firſt through the ſciatic, thyroid, and other arteries of the pelvis, into the articular arteries of the hip; then from the articular arteries of the hip into the profunda, which is their parent trunk; then it muſt have gone down from the main trunk of the profunda along thoſe lower branches of the profunda, which are named its perforating arteries; then, from theſe, the lower extremities of the profunda, it had paſſed into the articular arteries of the knee, and by this laſt inoſculation the blood once more had acceſs to the trunk, viz. to the popliteal artery, where it divides into the three arteries for the leg. In ſhort, it had happened in this caſe, as muſt always happen in ſuch caſes, that the ſmaller arteries of the whole thigh, were remarkably enlarged; and that eſpecially the arteries which paſs round the hip were both ſo much increaſed in ſize as to be able to carry along a ſufficient quantity of blood for nouriſhing the thigh; and that their inoſculating extremities alſo were enlarged in like proportion, ſo as to tranſmit a ſufficient quantity of blood for nouriſhing the leg. The blood had paſſed along by thoſe veſſels which lie upon the back part of the thigh, leaving the proper femoral artery dry of blood, and almoſt cloſed all the way from the groin, or rather from within the pelvis, down to the ham: I call upon Murray, with all his knowledge of the blood-veſſels (and no

inoſculating circle, viz. by the articular arteries of the knee, where of courſe the injection was a little retarded, but ſtill flowed out, "liquorem ſane effluere conſpexi" but infinitely leſs eaſily, "ſed longe lentius, parciuſque."

"Beneficio vinĉturæ in iliaca exteriori factæ, ac beneficio aquæ calidæ luteo infectæ colore, ſyphoneque in internam iliacam impulſæ, ſatis idoneum ad nutriendum articulum ſine ullo iliacæ exterioris auxilio ego jam circuitum inveneram. Luteam enim impulſam aquam prodire videram ex arteriis, perreptantibus articulum pedis, quem ipſe nuper abſtuleram. Verum poplitææ hujuſce arteriæ anguſtatio me impulit ad aliud inſtituendum experimentum, quod me doceret, utrum, iliaca exteriori, ſimulque poplitea vinculo adſtrictis, impulſoque in iliacam internam liquore, hic per diſſectas jam memoratas arterias exitum æque ſibi inveniret, ac fieri videram, dum exterior tantum iliaca ligata eſſet. Prius igitur hanc ſolum vinxi, injectuſque liquor de more ſatis copioſe profluxit; poplitea deinde quoque revincta, liquorem ſane effluere conſpexi, ſed longe lentius, parciuſque."

other man knows ſo much about them), to point out any other paſſage for that blood by which the limb continued to live.

It is not from the want of every other kind of proof that I here preſs the argument ſo ſtrongly. I do ſo only that I may impreſs it upon your minds, while I have many caſes in reſerve, more deciſive perhaps than this. In that caſe which I lately mentioned, where a ſhoemaker having dropped his paring knife, ſtruck it with the one knee againſt the other, ſo as to drive the point fairly into the femoral artery, Heiſter performed the cure, not by ligature but by compreſſion. He laid a long train of compreſſes over the whole courſe of the femoral artery, from the wounded part up to the groin. Now, when Heiſter bound thoſe compreſſes with the tighteſt rollers, drawn with all his ſtrength! when he continued for three weeks a compreſſion which commanded the hæmorrhagy, and ſtopped the motion of the femoral artery, what did he do? Is it to be believed that thoſe firm compreſſes merely ſuppreſſed the more violent action of the artery, and kept its wounded lips in contact with each other till they adhered and healed? Surely not! He kept not the lips only of the wounded artery, but its ſides, in perfect contact. When he thus cloſed the canal of the artery, the force of the circulation would fall upon the inoſculating arteries. They would ſoon enlarge to ſuch a ſize as to carry freely all the neceſſary blood. The circulating blood would no longer ſeek the main artery, which, being a contractile artery, would cloſe in all its extent, and would adhere at all thoſe points where it was particularly compreſſed. Heiſter's cure by compreſſion, would reſemble in all eſſential points the cure by ligature; in this only it would differ, that beſides being tedious, painful, uncertain, the cure by compreſſion would obliterate both trunk and branch; for ſince the profunda lies directly behind the femoral artery betwixt the compreſs and the bone (againſt which the artery is compreſſed), the compreſſes would obliterate the profunda, as well as the femoral artery, leaving nothing to ſupport the limb, but that ſeries of inoſculating arteries running along the back part of the thigh; the value of which I have juſt explained. In ſhort, the profunda lying ſo directly behind the femoral artery, as to be taken up by Gooch in the ſame ligature, may very reaſonably be ſuppoſed to be affected by the broad compreſs which, in this caſe of Heiſter's, covered the whole tract of femoral artery.

But there is alſo another phenomenon in diſeaſes of the femoral arteries, which is very intereſting, and which proves this point completely; for independently of operations by ligature or compreſſion, we have evidence in the natural cures (as

ſometimes nature herſelf performs the cure), that the profunda may be cut off, together with the femoral artery, and yet the limb may be preſerved. We ſee, for example, a great aneuriſmal tumor of the groin increaſing rapidly till the ſkin threaten to fall into gangrene, and we wait in great anxiety and fear for that laſt change, in which the ſkin is to burſt, and the patient to expire with one ſudden guſh of blood. The fever begins, the pulſation of the tumor ceaſes, the ſkin becomes livid, the whole limb is cold and without pulſe, every thing ſeems to foretel an inſtant gangrene. But theſe which are ſo often the mortal ſigns of gangrene in the whole limb, are ſometimes rather the preſages of a happy cure; for either the clotted blood has ſo accumulated, or (in the natural aneuriſm) the looſer coagula have ſo fallen down from the walls of the aneuriſmal bag into the main channel of the artery, as to ſtop the circulation from the groin downwards, in both the profunda and the femoral artery. Such obſtructions turn aſide the current of the circulation, new channels are found for the blood, and as it begins to flow more freely in theſe, the pulſe, the heat, the feeling of the limb, are all gradually reſtored, they are perfect in a few days; the patient awakens from the low delirium which accompanied the firſt alarming ſigns; not only his life is ſafe, but in a little while, his limb alſo is perfectly reſtored.

Nay, it has really happened, that very nearly the ſame proceſs has performed the cure, with this ſurpriſing variety, that during this natural cure, the tumor burſting, has laid the limb ſo open, that the ſurgeon has (if we may be allowed the expreſſion) been able to look into the limb, and ſee how its veſſels were affected.

* Petrus Antonius Ferrari, a cook, a man of about forty years of age, died of a very ſingular aneuriſm of the thigh. His body was diſſected by Petro Javina, a

* "Quinto idus Octobris 1765, in Sancti Spiritus Noſocomio lecto accipiebatur Petrus Antonius Ferrari coquus, quadrageſimum ætatis annum agens, qui cùm prima vice a me ſequenti mane inviſeretur, inventus eſt cacochymo corporis habitu præditus, continua, lentaque detentus febri, legitimoque aneuryſmate, pugni, grandioris nempe manus magnitudinem excedente laborans, quod trimeſtri ab hinc ſpatio in ſiniſtro inguine originem nanciſcebatur ſuam, et ſurſum, ac deorſum, abdomen ſcilicit, coxamque verſus, nonnihil extendebatur.

"Tumor, qui aderat tunc temporis, aliquomodo eſſe circumſcriptus, ac vehementer pulſare cernebatur; continuis doloribus, præſertim vero ſub noctem acerbioribus, Ægrum afficere conſueverat, ex quo cauſam percunctanti mihi, externam fuiſſe quum accepiſſem nullam, venerea ex labe omnimode derivandam eſſe, ex multis cicatricibus innotuit.

"Sanguis miſſus, et ſpongia, ex egelida poſca expreſſa, tumori impoſita, doloris etſi quandoque lenirent

celebrated ſurgeon in Rome. The hiſtory of his diſeaſe is as follows: " When I firſt ſaw him (ſays Javina) on the 11th of October, he appeared of an unhealthy habit of body, and was laid in the hoſpital of the Holy Ghoſt, with a true aneuriſm of the groin, as big as the fiſt. It had begun about three weeks before, and was now greatly extended, both upwards towards the belly, and downwards towards the hip. The tumor was circumſcribed, beating violently, and very painful, eſpecially during the night; and finding that it had ariſen from no external cauſe, I aſcribed it, ſays Javina, to the venereal diſeaſe, of which I obſerved many ſcars."

" Having bled the patient, and applied a ſponge ſoaked in cold ſolution, the pain was ſlightly abated, but ſoon returned with a ſtrong pulſation in the tumor. The tumor increaſed daily in magnitude; the pain, notwithſtanding, and the pulſation, became ſlighter; and on the 19th of October, the pain and pulſation ſuddenly and entirely ceaſed, with a ſenſe of burſting within, a ſudden flattening of the tumor, and an extenſion of it half way down the hip." Thus is the day and hour of the burſting of this aneuriſm correctly marked, and the conſequences of that burſting are next to be obſerved. " The œdema, which

acerbitatem, vehementius tamen paulo poſt pulſatio, et dolor augebantur; ſed hæc, poſtquam major in dies tumor factus in magnam excreverat molem, leviora fieri cœperunt, atque tertio decimo tandem kalendas Novembris magna cum tumoris depreſſione, nec non per internum pluſquam dimidiæ coxæ latus propagatione, levi prægreſſo fragore, evanuerunt.

" Verum exinde Œdema, quo leviter antea pes tantum afficiebatur extremus, cum caloris, ſenſus, motuſque deperditione ſic excreverat, ut univerſi pedis hujuſce vita in apertum diſcrimen veniret. Continuo idcirco linteum quadruplex, ex vini ſpiritu cum camphora expreſſum, imponi calide, et quam ſæpiſſime curavi, quo quidem præſidii genere, quadraginta horarum ſpatio, pars in integrum pene, Œdemate valde imminuto, reſtituebatur.

" Interim tamen in gangrænoſa tubera ſub inguine elevabatur tumor, quæ pridie kalendas Novembris ſub lucem diſrumpebantur, cùmque fœtentium humorum colluvie inquinatum ſummo mane ægrotum inveniſſem, diſciſſis, remotiſque faſciis, ac ſpleniis, quæ ante dies octo, quam hæc acciderent, parti applicaveram, quo eſſent impedimento, ne ex inopinato, tenuiſſima tumoris perrupta cute, exanguis fieret, magna inde nigerrimi ſanguinis copia, partim in grumos concreti, partimque in fœtidam ſaniem diſſoluti per fatiſcentia tubera, coccinei vero (quod maxime, ne fieret, verebar) ne guttula quidem effluente, effundebatur.

" Quare Ægro obſita illuvie depurgato, plagam linamentis quam molliſſime impleri, et linteis ex egelida poſca, quolibet altero die circumducta faſcia, velari curabam, atque per hæc, velamenta communia, nec non aneuriſmaticus ſaccus, cum annexis vaſis, nervis, membraniſque, quæ ab inguine ad mediam uſque coxam, et ultra computruerant, octidui ſpatio, quod ſponte abſque diſtractione fieri ſinebam, abſceſſerunt. Hinc factum eſt, muſculis, pectineo, iliaco, atque pſoas parte infera, ſartorio, anteriori denique tricipitis portione, denudatis, et a putredine vindicatis, triangularem alveum, poſtremis hiſce geminis præcipue intercluſum, ab

had hitherto been limited to the foot, now ſpread ſo rapidly, and with ſuch entire loſs of heat, feeling, and motion in the whole limb, as plainly to indicate approaching gangrene." " But by the continual and careful application of cloths ſoaked in camphorated ſpirits, the limb was, in the courſe of forty hours, almoſt entirely recovered from this condition, with a manifeſt reduction of the œdema.', " Meanwhile the tumor roſe higher and higher, with a livid and gangrenous bulging, which burſt at day-break on the morning of the 31ſt of October." In the morning, Javina found his patient ſwimming in fetid ichor. He immediately cut away the bandages, which had for eight days been applied by way of precaution, leſt the patient ſhould die of hæmorrhagy from the burſting of the weakened integuments. There was diſcharged from this crater a profuſion of black and fetid blood, partly grumous, partly diſſolved into a fetid ſerum; but of freſh and florid blood, which I greatly feared," ſays Javina, " not one drop flowed."

" He then cleaned the patient of this filth, filled the baſin of the aneuriſm with the ſofteſt lint, rolled the limb gently with a bandage which was renewed every ſecond day, covered the whole with pledgits wrung out of a cold ſolution, and ſuffered the dreſſings to remain for eight days till they looſened of their own accord, the

inguinis ligamento ad ſedem uſque, qua decuſſatim implicantur, vaſis, nerviſque cruralibus in eodem alveo excurrentibus, a putredine penitus deſtructis, expoliatum, rubentemque apparuiſſe.

" Cùm eo loci res eſſet adducta, tibi, vir clariſſime, qui ſponte ad ægrum inviſendum, rei novitate motus, acceſſiſti, non ſine admiratione inſpicere datum fuit.

" Quo vero ſordibus evacuaretur abdomen, in externum ulcus continue dilabentibus, ſcalpellum, ductore indice ſiniſtræ manus digito, per hiatum, qui tunc ſub ligamento inguinali patens erat, indebam, cujus ope ligamentum hoc, abdominis muſculos, nec non vilamenta communia, lata ſatis diſcindebam plaga, ſicque internum aneuriſmaticum cavum in apertum ponere, denſioribus ſordibus expurgare, eidemque cavitati feliciter adeo medicinam, quæ omnis in linteo carpto conſtiterat, mihi facere contigerat, ut cicatrix cum proximæ valetudinis ſpe proſperæ quaquaverſum duceretur.

" Attamen attenuatus æger, valentiſſimis licet juſculis aleretur, macie magis magiſque conficiebatur, ſic ut quinto tandem kalendas Decembris maraſmo abſumptus fuerit.

" Reſerato die craſtina cadaveris abdomine, viſcera omnia ſecundum naturam, ſi glandulas meſenterii, lymphaticaſque nonullas circa lumbos, mole nonnihil, ac duritie auctas, exceperis, reperta ſunt. Arteriam vero iliacam communem ſiniſtram, quam peritoneo exuebam, cùm eo uſque diſſidiſſem, ubi in iliacas minores diſpertitur geminas, externam ſcilicit, internamque, quæ et hypogaſtrica nuncupatur; iliacæ externæ oſculum (arteria pervia manente hypogaſtrica) duriſſimo, conoideoque operculo ſex fere lineas longo ex lympha concreta, cui archetypo fuerat, quin parietibus adhæreſceret vaſis, efformato obturari cernebam, quo ſublato, inditoque in conicum archetypum hunc ſpecillo tenuiſſimo, arteriam vix penetrabilem eſſe adnotabam. Quare hanc velamentorum, muſculorumque abdominis diſciſſionem in aneuryſmatis cavitatem uſque,

muſcles, nerves, and arteries, and the ſkin itſelf, having run into abſolute gangrene from the groin to the middle of the hip." "Then were ſeen the pectineus, the iliacus, the lower part of the pſoas, the ſartorius, and the fore part of the triceps, cleared of the ſloughs, red and granulating, and forming an empty ſpace, a ſort of triangular cavity, extending from the femoral ligament to the croſſing of the triceps and ſartorius muſcles, where the femoral artery perforates the thigh; the crural nerves and veſſels, which ſhould have occupied the hollow, being entirely deſtroyed by the gangrene."

"It was neceſſary to empty the internal abſceſs of that fetid ichor, which was continually draining down upon the ſore, I paſſed my fore-finger," ſays Javina, "under the ligament of the thigh, which was then open, and, by the guidance of my finger, I cut the ligament, the abdominal muſcles, and the ſkin itſelf, with an inciſion of no ſmall extent; and thus having opened the deepeſt part of the ſac, cleared it of the thick and foul matter, and dreſſed it with fine lint. The cicatrix advanced moſt proſperouſly on all ſides with every proſpect of recovery; but, notwithſtanding my utmoſt care with ſoups, and every thing nouriſhing to ſupport the patient's ſtrength, he ſunk daily, and died on the 27th of November."

"Upon opening the abdomen, every thing was ſound there except an enlargement and hardneſs of ſome of the meſenteric glands:" But when the common iliac artery was diſſected from the peritoneum which covers it, and ſlit open down to its diviſion into the external and internal iliac arteries, the internal iliac, or hypogaſtric artery, was found pervious, while the external iliac was found cloſed with a plug of coagulated lymph, very hard and firm, of a conical form, and half an inch in length; the plug had been moulded into this conical form by the mouth of

(peritoneum ſcilicit inter, et muſculos pſoas, atque iliacum internum, a quibus, ſanguine ex perrupto tandem aneuriſmatis ſacco in celluloſam ejuſdem peritonei epiphiſim erumpente, divellebatur) profecutus ſum, ſicque amplius duos pollicis ab ima operculi ſede detruncatam, ſub eoque craſſiorem quadruplo, ovalis figuræ, et ligamenti adinſtar duram, atque imperviam, cujus extremo laciniæ, diſcerptis veluti ſacci fruſtulis, ſuſpendebantur, pſoas muſculo adhærere advertebam.

"Arteriæ iliacæ ovalem hanc partem polypoſa ſubſtantia variæ denſitatis adeo infarctam eſſe diſcindendo adnotabam, ut tunicarum ejuſdem forma penitus deſtructa, in uniformem maſſam ſpongiæ cera imbutæ ſimilem, transformata videretur.

"Oſſa ilei, atque pubis eo loci, ubi arteria iliaca externa ex abdomine in cruralem abitura egreditur, ibidemque in inguine, ubi aneuryſma ortum habuit, profunda adeo obſidebatur carie, ut chroroidea cavitate nigrities late, apprimeque retegererur.

"Cruralis denique arteriæ caput inferius tenui, ac ſimbriata extremitate a ſartorio muſculo, cui nonnihil adhærebat, circa medium coxæ, nullo interpoſito ſanguinis coagulo, cogebatur."

the artery; the plug being withdrawn, and the probe introduced, the artery was found to be almoſt entirely cloſed." "The ſac of this aneuriſm was formed by the peritoneum, which was torn from the face of the internal iliac and pſoas muſcles, by the ruptured artery driving its blood into the cellular ſubſtance of that membrane." "The diſſection of the ſkin, muſcles, and of this aneuriſmal ſac, being continued downwards; and the artery cut acroſs about two inches below the point of this plug, it was found enlarged to four times its natural diameter, of an oval figure, hard as a ligament, impervious, and terminated at its lower end in rags and fringes of the aneuriſmal ſac." "This oval part of the artery was ſo choked with a ſort of polypous ſubſtance of various conſiſtence, that the arterial coats were confounded and deſtroyed, the whole being converted into a maſs reſembling a ſponge dipped in wax." "The bones of the pelvis, too, where the iliac artery turns over the groin, and comes out into the thigh, and eſpecially in the groin where the aneuriſm began, were thoroughly carious and black." "The lower end of the femoral artery was cloſed (without any plug of blood) by a fringed extremity of the ſartorius muſcle, to which it adhered ſlightly."

I could not, without this detail of all the circumſtances, venture to reaſon upon the caſe. We perceive, that in ſuch aneuriſms the force of pulſation becomes irreſiſtible in the progreſs of the diſeaſe; if the aneuriſm burſt before the arteries are all obliterated, the patient dies, in a few pulſations, of the heart, ſo profuſe and ſudden is the loſs of blood; but, if he eſcape this firſt danger, he may, though the arteries are obliterated, ſurvive even for months (for this patient lay three months in the Hoſpital) and yet in the end die exhauſted. The progreſs of this extraordinary aneuriſm is ſo diſtinctly marked from ſtage to ſtage, that we cannot but take a lively intereſt in the caſe. Firſt, The aneuriſm burſt; the blood was diffuſed among the cellular ſubſtance; the tumor flattened; the pain of diſtention ceaſed; the blood was no longer conveyed along the artery; the limb became cold, benumbed, motionleſs; and thus the patient lay for forty hours betwixt life and death. Secondly, The artery was at this time completely obſtructed, and the limb turgid, and in imminent danger of gangrene; but the heat and feeling of the limb returned, and the leſſening of the ſwelling ſhowed that the veſſels had renewed their action, and that nature had found out new channels for the blood.

Thirdly, The burſting of the tumor was not owing to the increaſing impulſe of the blood, for the artery had ceaſed to convey blood, its canal was obliterated; but the cellular ſubſtance was crammed with extravaſated blood, the fore part of

the limb was without circulation, the ſkin diſtended to actual gangrene, the tumor burſt in conſequence of that gangrenous ſuppuration which is inſeparable from this degree of diſtention, and when it burſt, the old and coagulated blood, or putrid ſerum, ſhowed the condition of the parts; not one drop of blood flowed, which proved the obliteration of the great arteries on the fore part of the limb. Javina feared this period, viz. the burſting of the tumor, he ſeems to have been for ſome time in fear of the artery throwing out its blood; but had he obſerved the coldneſs, the numbneſs, and the loſs of pulſation which muſt have accompanied this ſtate of the limb, he might have ſuſpected the total obliteration of all its great arteries.

Fourthly, This concluſion is common to Javina's caſe, and to other great aneuriſms, that while an aneuriſm increaſes in ſize it becomes irreſiſtible, and the parts cannot long endure the violence of its pulſation. But preſſure and reſiſtance are mutual! the ſkin cannot be affected outwardly without the parts within being deſtroyed; what deſtroys the muſcles will deſtroy the arteries; and thus the preſſure within may be ſuch as obliterate the artery before the burſting of the ſkin. If the aneuriſmal ſac burſt within before the external parts give way, the ſafety of the limb is almoſt enſured, for no blood moves along that artery; every thing is prepared for the final change; the blood finds new channels the moment the aneuriſm burſts, and the limb is abſolutely ſafe; we have only to cleanſe the ſac, to ſupport the ſtrength, and to ſave the patient from the profuſe evacuations neceſſarily flowing from this extenſive gangrenous ſac.

Fifthly, The main propoſition which I meant to eſtabliſh is here fully proved; there is no want of injections of yellow water to explain what had happened in this caſe. The aneuriſmal ſac burſt only after the obliteration of the arteries; then the ſkin gave way; the parts which had been injected with extravaſated blood fell ſucceſſively into gangrene; the ſac cleanſed and ſuppurated; the ſartorius, pectinalis, pſoas, and triceps muſcles, were freed from their ſloughs, and aſſumed a florid and healthy hue; the bed of cellular ſubſtance, in which lie the great veſſels and nerves, was quite empty, from the ligament of the groin where the artery firſt enters the thigh, down to the tendon of the triceps, where the ſame artery paſſes into the ham. The cellular ſubſtance, arteries, veins, and nerves, were quite deſtroyed: The emptineſs of this triangular hollow demonſtrates, that all the great veſſels were obliterated: The red granulated flouriſhing condition of the whole wound ſhows, that the limb was effectually ſupported by other arteries.

This caſe demonſtrates that the great arteries of the thigh itſelf may be deſtroy-

ed, not only without that gangrene which timid ſurgeons have foretold, but with ſuch vigorous circulation remaining in the limb, as to enable the ulcer to throw off its ſloughs like a gun-ſhot wound, and aſſume a healthy and granulating appearance, to heal rapidly, though too ſlowly (as in this caſe), for the patient's exhauſted ſtrength.

Morgagni * puts the following queſtion, " How, after that remarkable cure by Marcus Aurelius Severinus, could the crural artery, when putrified, diſſolved, and broken down near to the groin ; how could it, by the force of fire applied thereto, ſo recover its parietes, that the limb not only continued to live, but the man could even walk upright upon it with the ſmall ſupport of a low and ſlender cane ?" This queſtion is already reſolved : The artery did not recover its parietes, nor revive after being putrified and diſſolved ! but the branches of the profunda, which lie along the back part of the limb, were enlarged, and ſubſtituted in its place. I will relate the caſe to you with all thoſe circumſtances which ſeemed ſo wonderful to Severinus himſelf, and ſo inexplicable to Morgagni, but which you will eaſily underſtand., you will find in the following narrative old manners and antique ſurgery, but a caſe in all reſpects intereſting and well related.

" I was called, ſays Severinus, to R. D. Anſelmus Paganus, a nobleman, who had a tumor in the upper part of his thigh near the groin : he had been attended during four months by many phyſicians ; the caſe growing daily worſe, for the tumor at firſt, no bigger than a filbert, beating ſtrongly ſo as to move the bed-clothes, grew to ſuch a ſize, that it loſt its pulſation, and waxed as large as a winter gourd, with an unequal ſurface, marked with three prominent bumps."

" When the tumor was advancing towards its laſt ſtage, the pulſation was not only manifeſt to the hand, but was perceptible to the eye ; it was not a partial nor ſlight pulſation, but a big throbbing of the whole tumor ; it was terrible to the patient, who felt at each pulſation like the grating of a ſaw cutting and tearing acroſs the nerves and tendons. His attendants feared leſt he ſhould expire under the tortures of this pulſating pain. He had the Hippocratic face, the attendants were watching his expiring breath, and the prieſts and the pious friends were ſpeaking to him of the life to come. Night and day the bed clothes were raiſed by the ſtrong pulſations of the tumor, as if by the thumping of a hand. The phyſicians of the city all were at a loſs, ſome preſcribing one thing, ſome another. One ordered compreſ-

* Vide Alexander's Morgagni, p. 42.

ſes with plates of lead; another, a conſecrated plaſter; another, aſtringent embrocations: One ordered the application of a ram's hide, and ſuch things as were commonly eſteemed uſeful in hernia: another ordered the application of ſnow and ice; but one and all of them betook themſelves away as they conveniently could: One ſneaked off, another could not ſtay: another was in haſte: one ſcarcely ſtaid to hear the ſtory with decency, while another prognoſticated immediate death: ſome retired impreſſed with the horrors of the man's ſituation, and not indifferent to their own character: moſt of them gave him over to the upholſterers and ſextons: one celebrated phyſician, very celebrated when called to preſcribe, preſcribed only extreme unction*." By this part of the narrative, Severinus deſigned to ſhow to what a dangerous condition this poor man had arrived, and how wrong it is to pronounce a harſh ſentence, even in the moſt deſperate caſes. Here he deſcribes the ſcene which had paſſed before he was called; but the condition of the patient when he firſt viſited him was as follows: "He found the tumor running rapidly into gangrene, livid, covered with veſications, and the livor extended to the toe. The limb was quite inſenſible; he had wakeful nights, and horrid dreams; the eyes were, as in a coma, heavy and loaded; he had continual fever, with turbid urine; delirium at times, and great failing of ſtrength; the limb lay out motionleſs, but with terrible pain of the knee, ſhin, and foot; he could not move it, and cried continually to his friends to change the poſture of the leg, which gave him ſome ſlight relief.

Severinus having exhonoured himſelf by giving the prognoſtic natural in ſuch a caſe, applied an aſtringent in place of a relaxing poultice, and matters ſeem from this period to have taken a very ſudden and happy turn; for in a very ſhort time the livor of the tumor diſappeared, a ſmall part only in the centre of it remained inſenſible, and by the operation of a powerful antimonial both upwards and down-

* "Denique quod ſit ſummum omnium, et confirmatio pleniſſima, atque certiſſima; medici ex univerſa urbe præcipui, atque indies lectiſſimi, ad conſultationes acciti; hi quidem plumbeas deligationes, cum plumbea lamella; hi comitiſſæ inſcriptum ceratum varignanæ; hi embrochas adſtringentes; hi emplaſtra de pelle arietina, aliaque ad ramices et hernias celebria; hi denique aduſque nivis nicolai præcepto neceſſario uſum dicebant compulſum; adminiſtrarunt. Iſtorum vero omnium hi continenter abſcedere; hi quam citiſſime ſeſe expedire; hi vix audire et parumper conſiſtere; hi cum proteſtatione mortis certiſſimæ conſultare; hi refugere ab horrore et calumniæ periculo; hi veſpillonibus hominem et libitinæ devovere cœperunt. Fuit et famigeratiſſimus hercle medicus, qui, viſo ſtatim caſu, piamen crucis, ut fit pro luce perpetua, tantum ægro prætulerit. Ita rem ſumme extremam certo crederent omnes; ita nil quidem fuit certius aneuriſmate."

wards, he was relieved from all his worſt ſymptoms, and reſtored to eaſe, reſt, and ſleep; the leucophlegmatic ſwelling, extending from the tumor to the foot, was diſcuſſed from time to time by the occaſional application of aſtringent fomentations.

Then the opening up and ſloughing of the tumor began, or the necroſis, as the ancients called it, i. e. the gangrene, death, and ſeparation of the injured parts. "In three days," ſays Severinus, "after thoſe changes which I have juſt deſcribed, nature began to throw off that inſenſible part which remained in the centre of the tumor; upon obſerving which, I cauterized that central part with red hot irons, and repeated this cauterizing, morning and evening, for five days. The great ſlough being removed, there appeared under it a fleſhy-like membrane, perforated at various points, and beneath it the tumor or ſac itſelf full of black and grumous blood: Now Severinus cauterized with very broad and flat irons, applied one above another; he repeated the ſame next day; in the evening he drew out a full pound of coagulated blood, and in the night ſome ill-ſmelling blood iſſued from the opening.

Next day he cauterized all over the ſurface, plunging the iron, hiſſing among the ſtuff, as into water; he now uſed four large and flat cauterizing irons; and in the evening, upon lifting up the poultice, he took out, with a large ſpoon, fully two pounds of blood: Next day he plunged in the irons again, and raked out the blood, which now had a horribly offenſive ſmell, growing daily worſe; and in cauterizing in the evening, he extracted again, with his ſpoon, two pounds and a half of this putrid and grumous blood.

He now began to put into this great cavity aſtringent powders of alum, ſal-ammoniac, and ſome iron preparations, and laid over all cloths, with unguentum Egyptiacum, having firſt thruſt in tents ſpread with it. In this manner was the aneuriſmal cavity dreſſed every ſix hours, extracting at each time great quantities of corrupted and very fetid blood; and ſome days after this kind of dreſſing was begun, he tore out, with his forceps, a piece of ſpongy looking fleſh (probably a firmer coagulum of blood) of about a pound weight, from which time he continued the ſame medicines, but uſed them more ſparingly.

When in a little time this flux of putrid blood had ceaſed, and nothing remained except putrid fleſh, that is, the canals of the veins and arteries, and the fibres of the putrid muſcles and tendons cauſing an intolerable fetor, having extracted a part of this putrid ſtuff, and finding leſs of it next day, he began to uſe a mundificative, the wound having been firſt waſhed with wine, ſpirits, ſalt, and honey (an

odd compoſition, but powerful enough if uſed ſtrong), a putrid nerve of three inches long (half a palm) having been extracted, the wound was tolerably clear; thus the mundificative was applied, and next day the whole wound ſeemed purged and clear, and the bone lay bare about an inch in breadth, and three inches (half a palm) in length.

Severinus then took a reed, and blew in catagmatic powders upon the bone, and over the whole ſurface of the cavity; the hollow or baſin of the aneuriſm was of ſuch ſize, as to require no leſs than half a pound of lint to each dreſſing to ſtuff it with. He dreſſed the bone particularly with the catagmatic powder, and moiſtened with ſpirits of wine all the naked part of the bone; he laid over all, an ointment made with gum elemi, and he waſhed the general ſurface frequently with Aqua Gurgitelli; and he very ſeriouſly attributes the blackening of the bone, its total exfoliation, the riſing up of the granulations, the generation of fleſh, and whatever good pus was poured out, all to his Aqua Gurgitelli and catagmatic powders, as if the man had not been alive, and nature working in his limb to more purpoſe than the phyſician. The quantity of ſerum diſcharged was ſo great as to require dreſſing twice a day; at one time the running was ſo great, that they were obliged, beſides the lint, to uſe ſponges to ſuck up the moiſture, and the limb downwards from the knee to the ancle was greatly pained and convulſed, for which it was rubbed with turpentine, oil of wax, and cock's greaſe: But the cure advanced, fleſh was granulated, the bone was covered with granulations, though ſometimes the parts looked ſo ill, and the matter was ſo profuſe, that they needed to dreſs thrice a day. How Severinus continued to dreſs the bone, and aſſiſt the granulation, it were tedious and uſeleſs to relate; it is ſufficient to obſerve, that the cure was going on from January, the time of the gangrene, to the end of Auguſt; that the fleſh of the groin filled up perfectly; that the patient walked well and firmly, ſometimes uſing a ſhort ſtick, but ſometimes alſo walking well without one."

This is a ſingular caſe, and a very tedious cure; but it is not becauſe the hiſtory of the diſeaſe is related with many touching circumſtances that we read of it with intereſt; this phenomenon of the obliteration of the great artery of a limb is one of the moſt extraordinary in the economy of the human body, and is always attended with circumſtances which muſt intereſt us in the fate of the patient ſo near death! ſo miraculouſly reſtored.

The rivals of Severinus accuſed him of curing ſo deſperate a caſe only by

witchcraft and enchantment; but if there was any thing of this kind in the cure, ſays Severinus, it was only the miraculous power of fire *. Severinus himſelf, ignorant of pathology, aſcribed every thing fortunate in this caſe to the power of fire and his catagmatics. He believed, like Morgagni, that the artery ſurvived amidſt this wide deſtruction of parts, and, like Morgagni, was aſtoniſhed at his own ſucceſs.

This caſe adds one more proof to thoſe which I have taught you. When the pulſe ceaſes the artery is oppreſſed; while the artery is oppreſſed by its own aneuriſm, the inoſculations are enlarging; every thing is prepared by nature for the ultimate change! The main artery is obliterated, the inoſculations nouriſh the limb; the aneuriſm may burſt, but the patient cannot bleed to death. When the parts gangrene down to the bone, and the bone itſelf is expoſed, black and carious for three inches in length! when a nerve, as Severinus calls it, ſome inches long, is hooked away with the other ſloughs! when the great crater of ſuch an aneuriſm is dreſſed to the bottom to the very bone for ſeven months! we need not inquire how the artery has reunited ſo as to perform its functions. Such artery is deſtroyed, and the inoſculating branches of the profunda perform its office! Nature has ſaved the patient from the burſting of the aneuriſm, and the limb from the deſtruction of its artery, the chief difficulty of the phyſician is to ſave the patient from the waſting which accompanies ſuch an extenſive ſore, whoſe ſurfaces, external as well as internal, are all gangrenous, and ſlough like a great gun-ſhot wound †.

* "Porro quod incantamento, vel ope magica, tam inſuperabile malum ſuperaverimus (ut quidam noſtris ex aemulis dixerunt) tum ridiculum, tum invidentiæ ore projectum, apparet: incantamenti certe vim, et magicam præſtantiam, æmulatur et exaequat, rite recteque comparata, apte accommodata, et opportune adminiſtrata, vividi præſidii, manuſque divinæ, vis, quod ignem appellamus, energia: hujus quanta ſit virtus, amplitudo, et inter cuncta Medici adjumenta, majeſtas in opere pyrotechnia, fuſe ac plene per nos eſt credo demonſtratum."

† "Some years ſince, I was deſired to give a viſit to a man lying in my way to Whitehall. He had a large white tumor poſſeſſing the fore part of his right thigh, of a few months growth; it was ſoft from the firſt appearance, and obſerved by the patient to be bigger and leſſer one time than another. I conſidered the ſwelling, and concluded it an aneuriſma. That there was no pulſation to be felt in it, was becauſe it lay deep among the muſcles, in which caſe the pulſe is frequently intercepted. There lay a gummy emplaſter upon it, and an attempt had been made to open it by cauſtic; but it not penetrating deep enough, the eſcar ſeparated without reaching near the cavity. I declared to the patient my thoughts, viz. That the ſwelling proceeded from blood poured forth of its veſſels, either by eroſion from within, or by ſome outward cauſe,

But hitherto I have ſpoken only of natural cures, in which there is a ſlow diſtention of the artery, and a gradual dilatation of the inoſculating branches, where the blood is worked ſlowly on from branch to branch, till many are enlarged, and much blood is conveyed by the collateral arteries before the main artery is choked up. But is it not ſtill poſſible that, were the limb ſuddenly deprived of its main artery, gangrene might enſue? It ſhall next be my buſineſs to prove, that the artery being tied, and the blood ſuddenly intercepted, the limb will not fall into gangrene.

as by riding, &c. and adviſed him not to permit the tumor to be opened, deſiring that, if his chirurgeon ſhould perſiſt in the ſuppurating or opening of it, he would ſend to me to meet him."

"Some few days after, the patient ſent me notice that his chirurgeon had been with him, and reſolved to open it; whereupon I took the next opportunity to ſpeak with the chirurgeon, and went along with him to his patient; where I endeavoured to perſuade him that the ſwelling aroſe from blood, and withal propoſed a palliative cure by a laced trowze and ſome good reſtrictive. But the chirurgeon declared himſelf poſitively for the opening of it. I ſeeing his reſolution, replied, Since you are ſo opinionated, you may (if you think good) make a trial of the tumor, by thruſting a ſmall lancet directly into the middle of it; and if, upon pulling out of the lancet, it appear mattery, you may lay it more open; if it appear bloody, you may more eaſily cure it than one made by a cauſtic. He readily aſſented to the trial, and the patient rejoicing in the propoſal, he attempted it with a lancet; but not thruſting it deep enough to reach the cavity, I took the lancet, and, paſſing it into the ſame opening he had made, thruſt it directly down into the cavity, and pulled it out bloody, but not one drop followed it. The chirurgeon not being therewith ſatisfied, I wiſhed him to paſs a ſmall probe down into the opening: He did ſo; and I alſo made a ſearch with the ſame probe, and felt the cavity large and full of liquids, which was certainly blood, the probe coming out bloody. I perſuaded the patient to keep his bed till that puncture ſhould be agglutinated, and adviſed the chirurgeon to be careful in the cure of it. We dreſſed it with a pledgit of Leniment. Arcæi, with emplaſter and bandage: to the uſe of which medicine I left them, not doubting of their care in healing up ſo ſmall a puncture. About ten days after, walking near the door in a dark evening, weary, and deſirous to reſt myſelf, the thoughts of this poor man inclined me to go into the houſe. I inquired of the landlady if he was within? ſhe replied, He is dying: That upon the riſing out of his bed, the blood had burſt forth exceſſively: That the chirurgeon had for ſome days endeavoured to ſtop it, but had ſince left the patient, and a neighbouring woman had applied a poultice to it; and that the chamber ſtunk ſo extremely, as it would poiſon me to go into it. I went up, and found the room ſcattered with ſtinking bloody cloths, and the poor man languiſhing in his bed, which was not cleanlier. I ſent preſently away for the chirurgeon, and in the mean while made rollers and compreſſes, and ſent for ſome yeaſt and wheat flour. The chirurgeon being come, we ſpread a mixture of them upon cloths, and armed ſeveral tents with the ſame. Having thus prepared our dreſſings as the time would permit, we took off the bloody ones, and held the orifice clean, while we cleanſed the thigh from the poultice and blood, then ſtopped the orifice with a tent proportionably, and applied our agglutinatives over, with compreſs and bandage wrung out of oxycrate. We rolled the member moderately ſtrait, then laid him

" Thomas Morris, a ſeaman, twenty-four years of age *, one of the crew of the Fiſhguard, was wounded acroſs the top of the thigh with a muſket ſhot, in an engagement with the French frigate l'Immortalité. The wound was three inches in length; it paſſed acroſs the thigh, from within outwards, a little way below the edge of the crural ligament. He ran down to the cockpit, where his cries were ſo outrageous as to ſurpriſe the ſurgeon, who ſaw only a ſuperficial wound, without even the uſual degree of hæmorrhagy; but it will preſently appear that this exceſſive pain muſt have proceeded from the laceration of the anterior crural nerve, which lies on the fore part of the femoral artery, encloſed along with it in the ſame ſheath."

" He was laid in Plymouth Hoſpital on the 4th day of his wound, (the 23d day of October 1798). The wound looked black and ſphacelated; the ſloughing was already begun: On the 5th day the ſloughs began to be thrown off; and on the evening of that day, he, for the firſt time, loſt blood to the amount of two pounds, but this hæmorrhagy ceaſed before the ſurgeon could be called. That night he paſſed in a very reſtleſs and agitated ſtate; and next day, the ſixth from the time of the wound, at eleven o'clock in the morning, while one of the gentlemen was removing the dreſſings, the femoral artery itſelf burſt, and threw its blood

clean, and cauſed a meſs of caudle to be given him, and encouraged him with hopes of recovery. The chirurgeon pleaded for himſelf that he thought the patient had been dead."

" Three or four days after we dreſſed him again, and found him much recruited in his ſpirits, he not having bled one drop; and indeed the emplaſters adhered as cloſe to the ſkin as we could deſire. After we had taken out the tent, abundance of grumous blood iſſued forth: we cleanſed it away, and ſhaked into the abſceſs about a drachm of Merc. Præcipitat.; and though we had then choice of medicaments, yet we applied the ſame as before, and continued that method of dreſſings, till the blood was converted to matter. Then we ſlit open the oriſice, and dreſſed it as a ſinous ulcer. After ſome days, obſerving that the matter could not diſcharge while he kept his bed, till the abſceſs was full to run over, we cauſed him to riſe out of it; but that little while he was up he ſwooned; wherefore we put him to bed again, and allowed him ſtronger nouriſhment, and by a ſeton needle made way for the diſcharge of matter to more advantage. The abſceſs being well diſpoſed to cure, I left him again to his chirurgeon, who cured him."

" This experiment of opening aneuriſmas by puncture is not to be imitated, unleſs it be in ſuch caſes as this, where both patient and chirurgeon are ſo incredulous." WISEMAN, p. 23.

* This caſe is tranſmitted to me by Mr. Stephen Hammick junior, of Plymouth Hoſpital, as a confirmation of what I have ſaid concerning theſe inoſculations of the profunda in my former Book on Wounds; and his letter is full of ſuch flattering expreſſions as I cannot repeat, but I am not inſenſible of them, nor of the care with which Mr. Hammick has drawn out the caſe for my private uſe; but ſuch a debt is beſt transferred from myſelf to the public; Mr. Hammick will be always known for his zeal in his profeſſion.

with prodigious force; but he immediately thruſt a compreſs into the wound, maintained it with a firm preſſure, and ſo ſuppreſſed the bleeding."

" Mr. Hammick was ſent for, who, being in the ſame building, very ſoon arrived to the patient's aſſiſtance; and the compreſs being a little raiſed, he laid hold, with his fore finger and thumb, of the upper part of the femoral artery; with the left hand he removed the clotted blood, dilated the outer edge of the wound, that he might ſtrike the needle more freely; and then paſſed the needle under the artery; and with a firm ligature, tied in at once the artery, the vein, and the anterior crural nerve. They could not be ſeparated from each other from the artery being ruptured ſo very high. He would alſo have applied a ligature below, but the diſeaſe extended downwards along the lower part of the artery: that intention was therefore forſaken, and a compreſs and roller being applied, the patient was laid to reſt with an attendant watching by him day and night."

" A total deadneſs, as the man expreſſed it, with inability to move the limb, immediately enſued; and half an hour after, the heat of the limb being meaſured by Fahrenheit's thermometer, was found ten degrees lower than that of the ſound limb. He ſlept, or rather dozed, during the whole afternoon, complaining but little; towards evening, about ſix o'clock, he ſaid he could feel the diſeaſed limb as well as ever, and he moved it into another poſture without help; its natural heat returned; the temperature of both limbs was now equal, the pulſe quick, and the ſymptoms moderate. This firſt night he paſſed tolerably well; he ſlept the greater part of it; but he was once, during the night, alarmed with a fearful dream, and awoke in great terror. The wounded leg was now rather warmer, the pulſe very quick; he complained much of thirſt: He was feveriſh during the whole of the following day; it was about nine in the evening that the fatal bleeding came on! at nine in the evening the hæmorrhagy firſt burſt out, and he loſt about two pounds of blood; it was ſoon ſuppreſſed by applying a compreſs, and it was obſerved that the ligature of the femoral artery was perfectly ſecure, the blood had come only from the lower part of the wound: the man was greatly exhauſted by this hæmorrhagy, and in ſuch caſes the ſlighteſt return of bleeding is fatal; next morning a ſlight hæmorrhage appeared, and he expired about eight o'clock, viz. forty-five hours after the burſting of the femoral artery."

" Mr. Hammick was not permitted to inject the limb, but he diſſected it with particular care. He found his ligature perfectly ſecure; it was placed cloſe to the ligament of the thigh. The artery below this was in a ſloughy condition, quite

ſphacelated; its walls full of holes; and this ſtate of the artery extended from the groin, where the ligature was applied, a great way down the femoral artery; it began about the 8th of an inch below the ligature, and continued three inches beyond the point where the profunda goes off. The upper part of the profunda, and the orifices of the two circumflex arteries, were diſeaſed; much coagulated blood lay behind the arteries, filling the interſtices of the muſcles. The anterior crural nerve was encloſed in the ligature, and ſome of its fibres were transfixed by the point of the needle, and divided."

All the ſteps of that proceſs, which I have repreſented to you, are well marked in this caſe. This is an example of the ſecondary hæmorrhagy peculiar to gun-ſhot wounds. The ball had not cut nor wounded the femoral artery, but grazed it. The ball had paſſed cloſe upon the artery; it had even torn the ſheath in which the artery is encloſed; the extreme and frantic pain which this man ſuffered can be accounted for only by the wounding of the anterior crural nerve, and that nerve lies along by the artery encloſed in the ſame ſheath with it. When the ſloughing, or, in other terms, the gangrene of the wound began, the vein firſt gave way, and there was a ſlight bleeding, eaſily ſuppreſſed by a compreſs. When the deeper ſloughs fell off, the artery itſelf next gave way, with an impetuous guſh of blood. When the artery was fairly ſurrounded with the ligature, and its blood ſuddenly intercepted, the deadneſs and coldneſs (ſo perceptible in leſs than half an hour) ſhowed how few of the arteries of the limb were then in an active ſtate, how ſudden the effect of the ligature was. When the heat, ſenſibility, and motion of the limb returned, and the temperature of this limb roſe above that of the ſound one, it was demonſtrated that the whole veſſels of the limb were then excited to ſtrong action to ſupply the loſs of the femoral artery. The circulation was re-eſtabliſhed all at once, juſt as in our injection the fluid goes round, by one ſtroke of the ſyringe, from the arteries of the pelvis to thoſe of the thigh. And, finally, The return of the blood by the lower part of the artery, while the upper part was ſecure by the ligature, demonſtrates that kind of circulation which is already ſufficiently explained. It was this ſecondary hæmorrhagy from the lower part of the artery that was fatal; the blood had come down through the ſciadic and thyroid arteries, had poured into the profunda, and had welled out through the criblous or ſieve-like part of the ſloughing artery. To have ſaved this man's life, then, the blood muſt have been oppoſed at this point, and forced to paſs through ſtill ano-

ther circle of inoſculating arteries. In place of being allowed to enter the profunda, or femoral artery, it ſhould have been forced on through a ſecond ſet of inoſculations till it reached the main artery by the ſmall articular branches of the ham. Mr. Hammick has the politeneſs to aſk, What ſhould have been done? To have cut downwards to the ſound part of the artery would have ſerved no good end! Ligature in ſuch a caſe was impoſſible! Ligature, in any caſe of hæmorrhagy, from ſloughing or gangrenous arteries, is not to be truſted; for ſloughing opens various paſſages for the blood, which no ſingle ligature can command.

Had an injection been thrown into this limb after death, it would only have ſpoiled the diſſection, for it would have exuded through many arterial mouths; not only from the criblous part of the ſloughing artery, from the profunda, and from the circumflex arteries of the joint, but from every ſmall inoſculating twig that opened upon the inner ſurface of this gangrenous ſac. Perhaps this ſac ſhould have been filled with dry and firm ſponges, and the limb rolled from the toes upwards with a firm bandage. Preſſure and the ſponge are, I apprehend, ſufficient to oppoſe every ſecondary hæmorrhagy proceeding from inoſculating arteries and refluent blood. Preſſure would have been ſufficient, perhaps, to turn the blood ſtill farther round into more diſtant channels; a ſponge and preſſure are alone fit to oppoſe hæmorrhagy from a broad and gangrenous ſurface.

But, in juſtice to this intereſting ſubject, I muſt lay before you one caſe more, which I am induced to do for two reaſons; in the firſt place, the caſe is perfect, the patient having lived; and, in the next place, I have but to preſent the caſe to you in a fair tranſlation, the chief accidents of it are already explained; and if you reaſon for yourſelves, as I have argued on the other caſes, you will find it clearly proved, that in the following operation (which was performed by the celebrated Guattani), not only the profunda was compreſſed along with the femoral artery, but the external iliac was ſo compreſſed alſo at the paſſage from under Poupart's ligament, that every artery on the fore part of the thigh was ſtopped.

" A goldſmith of the name of Morellus, fifty-five years of age, conſulted Guattani about opening a tumor in the groin, which all the other ſurgeons declared had come to a perfect ſuppuration. Morellus had, during the whole winter, complained of a ſettled pain in the right groin, ſometimes milder, ſometimes very violent, but never abſent; accompanied, during the winter only,

with a degree of lameneſs, but now in the ſpring it had begun to ſwell. When this unlucky Morellus, going along with others on the 4th of June to St. Peter's, to ſee the pompous ceremony of the conſecration of the hoſt, was ſeized ſuddenly with ſuch dreadful pain, that he was obliged to go home, and partly from fear, partly from the violence of the pain, went to bed and lay for three months under the care of his phyſicians, their preſcriptions all ineffectual, his diſeaſe increaſing daily. The unfortunate Morellus, now almoſt hectic, was entirely confined to bed; there was great ſwelling of the groin, contraction of the thigh, (ſo that he could not ſtretch it out), and a diſtinct fluctuation in the groin, which extended from the ſymphiſis pubis to the ſpine of the ilium, but ſtill without tenſion or pain; on the contrary, the fluid fluctuated freely, and ſeemed to be immediately under the ſkin."

" Guattani could not allow himſelf to believe this to be a proper ſuppuration, becauſe the fluctuation brought no relief; and, though there was no pulſation, he yet ſuſpected aneuriſm, and explaining himſelf on this head to the conſulting phyſician and ſurgeon, Amicio and Maximinus, both profeſſors in Rome. They agreed to ſpend a few days longer in trying common remedies, partly that they might make a trial of ſuch remedies as might be thought adviſable, but chiefly to allow time for Guattani to make up his mind concerning the nature of this diſeaſe."

" After fifteen days, they found no change, except a new ſuppuration within four fingers breadth of the great trochanter, and therefore reſolved to do the operation, and to cut into the groin at the place the moſt favourable for ſtopping the flux of blood, in caſe of Guattani's fears about aneuriſm being well founded. But leſt the aſſiſtants or friends, and more eſpecially the patient himſelf, ſhould be alarmed with the ſight of blood, Guattani talked over this ſubject with the patient, aſſured him that he had provided every thing for ſtopping the blood, and explained to him at the ſame time how eaſy it would be to enlarge his ſmall inciſion, in caſe of there being pus only in the tumor; he mentioned alſo, that in caſe of pure blood flowing, he would preſently give it a free exit, ſo as at leaſt to empty the bag, and would let the freſh blood run out, even after the emptying of the bag, if his ſtrength would bear it; after which he pledged himſelf to ſecure the artery by compreſſion, if he could only get his compreſs fairly put down upon the artery itſelf." " After all this," ſays Guattani, " I truſt there will come on a good ſuppuration, and that you will be reſtored to perfect health; at

all events, this is expreſsly what muſt be done, and all that can be done to attain that deſirable end."

" Morrellus heard me," ſays Guattani, " with a compoſed mind, and we proceeded to our operation boldly; being provided with baſons for receiving the matter, and compreſſes and bandages for commanding the blood. Then the ſurgeon Maximinus introduced his curved biſtoury delicately into the higheſt point of the tumor, near the criſta ilii where the ſkin was particularly thin, when inſtantly pure blood guſhed out violently to the great alarm of all preſent. But encouraging the patient, I took one of the baſons," ſays Guattani, " in my own hand, and extracted ſuch quantities of blood by this ſmall opening, that I filled one baſon, took up a ſecond, and ſtill continued my work, till the pure arterial blood began to flow, and the patient to faint." The blood was ſtopped by Maximinus clapping his thumb upon the orifice; and Guattani, by graduated compreſſes, piled one above another, with firm bandages, ſo ſuppreſſed the bleeding, that the patient did not faint, but, on the contrary, was preſently relieved from all his fever and pain; and being ſupported with cordials from time to time, he went on without either bleeding or any other bad ſymptom, and without needing even to have the bandage undone till the 13th day, when the dreſſings being removed, nothing flowed from the wound but a little pus; which ſhowed that the artery was fairly cloſed, and encouraged them to go on with the cure. Although the ſuppuration was not exceſſive, they were forced to make a counter-opening; they accompliſhed the cure in little more than two months.

Now the diſcharge of coagulated blood only followed at firſt by a diſcharge of freſh arterial blood; the patient feeling no lowneſs nor debility during the emptying of the great bag, and his fainting whenever the pure blood began to run; prove this to have been an aneuriſm, and Guattani's intention in allowing ſome of the arterial blood to eſcape, was, that he might have a greater command of the artery, and be enabled to compreſs it.

It ſignifies nothing to the point, whether this was or was not an aneuriſm; nor, if truly an aneuriſm does it ſignify whether it were an aneuriſm of a branch only, or of the main artery of the thigh; nor is it of much importance whether the aneuriſm was above or below the point at which the profunda goes off. The queſtion is, whether the main artery was ſtopped above the profunda by the violent compreſſion which they needed to make? And this is ſolved by Guattani's reflections upon the caſe, which are as follows:

"This caſe ſettles," ſays Guattani, "two great queſtions which diſturbed me very much; for, in the firſt place, the preſſure was ſuch as to prevent the leaſt drop of blood from paſſing down the artery, whence I was ſatisfied that the limb was nouriſhed by the internal iliac artery alone; and ſince this aneuriſm was cured by compreſſion merely, I am ſatisfied that compreſſion will cure any aneuriſm, whether from wound or from diſeaſe."

The ſtrong concluſions of this caſe alſo, the celebrated Murray tries to eſcape, by ſaying, "Vero ſimile videtur, arteriam femoralem ſupra inguen jam diviſam fuiſſe, nam alioquin, toto trunco compreſſo, vix auſa tam fortunate ceſſiſſent." If this femoral artery did actually divide into two equal trunks, which way could they paſs along to the thigh but over the pelvis? or how eſcape that compreſſion which obliterates ſo effectually both the femoral artery and the profunda? Yet why ſhould we allow ourſelves to argue thus about a mere hypotheſis? This is but the old analogy of the brachial artery forking high in the arm! a luſus naturæ is imagined to fulfil that purpoſe for which nature has ſo very amply provided; thoſe authors would rather have a limb ſaved by miracle than by the proviſions naturally belonging to its own organization! But you know by what proviſion of nature ſuch a limb is ſaved, and how to overlook the authority even of Murray when oppoſed to facts.

## CONCLUSION.

There is no general fact in all the circle of pathology, of which we are more abſolutely aſſured than of this univerſal inoſculation of the veſſels of a limb, and of the general obliteration of its arteries, without any danger of gangrene. The proofs which I have laid before you are like a great experiment, varied in every poſſible form, and with circumſtances ſo peculiarly ſtriking, as to impreſs the fact on our imagination, as well as to ſatisfy our reaſon. In one caſe, a natural aneuriſm is enlarged to the utmoſt poſſible extenſion, the parts ready to burſt, the artery obſtructed even by the preſſure which its own diſeaſe had produced; the limb lying ſwelled and deformed, with hardly any remains of vital heat, verging towards gangrene. Then the collaterals enlarge, the limb warms, the circulation returns, the limb at laſt grows turgid with blood, its heat riſes beyond the natural

ſtandard, and the patient awakens as from a ſleep of death. When the limb thus recovers, the ſwelling ſubſides, the ſtrength of the limb is gradually reſtored, but in the place where the trunk of its blood-veſſels ſhould be found, there is only a firm cord of ligamentous ſubſtance, knotty and hard, occupying the bed of the obliterated artery.

In a ſecond caſe, we ſee the ſame proceſs under another form. The aneuriſm burſts within, the blood is driven far and wide among the cellular ſubſtance, the artery is torn up from its bed, and inſulated and compreſſed, the muſcles are diſplaced, the extravaſation occupies every interſtice, the parts and their functions are diſordered to the utmoſt degree, but the diſtenſion ſtops ſhort of gangrene! the aneuriſm burſts at laſt, the circulation on the fore part of the limb ceaſes, that along the back part of the limb is eſtabliſhed, the patient lives ſome weeks, and then expires exhauſted by fever, pain, and every kind of diſtreſs. Upon opening this limb, the artery is found to have been dilated into an aneuriſm, the canal of the artery is found choked at its upper part with a firm clot of blood, the aneuriſm is found to have burſt in the middle ſpace of the artery, and in its lower part the artery is flattened, its ſides have adhered, and its canal is obliterated where it approaches the ham! Such a patient ſurviving this deſtruction of the veſſels during four weeks, is as ſufficient a proof of our doctrine as if he had lived for years.

But ſtill, as if for our entire ſatisfaction, another variety of the caſe appears; the aneuriſm burſts internally; the circulation is for ſome hours almoſt interrupted; the heat of the limb is at length reſtored; the artery is obliterated, and diſcharges no more blood, but it has already injected the cellular ſubſtance with blood beyond what living parts can bear; they gangrene; the ſkin burſts; the thigh opens as if to ſhow what had paſſed within; the parts ſlough like the ſurface of a gun-ſhot wound; the cellular ſubſtance is purged away by ſuppuration till the muſcles are cleanſed; you can count the muſcles as they lie in the bottom of the great ſac; the triangular hollow which lodged the great veſſels is expoſed. Though the great veſſels have been long deſtroyed, yet the patient continues to live; or, if he dies after much ſuffering, it is only becauſe he is exhauſted by the fever and profuſe diſcharge.

Yet this is but as a theory; theſe facts do no doubt eſtabliſh a ſort of abſtract point of doctrine, "that though the great arteries of a limb be deſtroyed, the limb may ſurvive;" yet there is here no authority for the practical ſurgeon, who is reſponſible for

every new and dangerous operation; he muſt have proofs more relevant than this, and ſuch proof we have in the two operations which I have laſt deſcribed. In the caſe by Mr. Hammick, the femoral artery was torn or burſt from ſphacelation, and the current of its blood interrupted! it was tied cloſe to the groin! after an interval of ſuſpended circulation, the limb recovered its heat, and there was too fatal a proof of a lively circulation, for in no long time the circulation became too powerful for the weakened arteries to reſiſt; that blood which was now paſſing freely, and nouriſhing the limb, burſt out from below through the ſphacelating and ſloughing artery; it was in conſequence of hæmorrhagy by this retrograde channel that the patient died.

But, laſt of all, in the caſe of Morrellus; the operation for aneuriſm was boldly and ſucceſsfully performed by the two great Roman ſurgeons Maximinus and Guattani, who, amidſt a confuſion of blood and matter, aneuriſm and abſceſs, ſought out the artery, found it, obliterated it by compreſſion, and actually ſaved the patient from death that ſeemed inevitable.

As I proceed in this important ſubject, you will find me deſcribing a variety of aneuriſms; and ſince I have taught you to reaſon upon theſe facts, you will, without my aſſiſtance perceive, that in every aneuriſm cured by bandage the artery is obliterated by compreſſion, and alſo that every aneuriſm ſpontaneouſly cured, is cured merely by the obliteration of the artery. But I am now engaged in explaining the efficacy of inoſculating arteries; and one department of the circulating ſyſtem remains to be ſlightly noticed, I mean the economy of the arteries of the arm, where alſo the powers of the circulation will be found equal to every interruption.

## THIRD, OF THE INOSCULATIONS WHICH IN CASES OF ANEURISM OR WOUND SUPPLY THE PLACE OF THE BRACHIAL ARTERY.

Though the arm is ſmaller than the lower extremity, a circumſtance worthy of attention, according to the doctrines of the older phyſicians, this did not at all abate their apprehenſions, they believed that ſtopping the axillary artery muſt be followed by gangrene of the arm! But according to the doctrine which I have

laid down, the ſize of a limb makes no difference in this argument, the arteries of each limb are proportioned to its bulk, the inoſculation of arteries is eſſential to the ſound conſtitution of each part, and the inoſculations of arteries are proportioned to their ſize; the arm, like the lower extremity, is endowed with every proviſion for ſupporting its circulation under the accidents of wounds and aneuriſms; its arteries are proportioned in ſize to the bulk of the limb; and the order of the inoſculating arteries in the upper and in the lower extremities is nearly the ſame.

Firſt, The arteries which ſurround the fleſhy joint of the ſhoulder may be very aptly compared with thoſe which ſurround the hip: One very long and ſlender artery comes out of the thorax, it is among the firſt branches of the ſubclavian artery, often it is an independent branch, not unfrequently it is the chief branch of the lower thyroid artery, it is long and tortuous, and paſſes directly acroſs the root of the neck; it enters into the notch in the upper border of the ſcapula, and ſupplies the muſcles which cover the ſhoulder blade; it is called the Tranſverſalis Humeri, but ſhould rather be named the Supra-Scapular Artery *. This is a branch on which we may rely, for it makes many inoſculations with the next branch, the ſub-ſcapular artery.

Secondly, The ſub-ſcapular artery is exceedingly large; it is equal in diameter to the humeral artery itſelf; it bears the ſame proportion to the axillary artery that the Profunda Femoris does to the iliac artery at the groin; it comes off from the axillary artery nearly oppoſite to the ſhoulder joint; it turns immediately round the edge of the ſcapula, and makes very free inoſculations with the extreme branches of the ſupra-ſcapular artery, and with thoſe long and ſlender arteries called Cervical, which twine round the root of the neck and top of the ſhoulder.

The third artery is a great one, though often it is but a branch of this ſub-ſcapular artery; it comes off at the joint, and no ſooner does it leave the axillary artery, than it turns quickly round the joint, to which it is ſo entire-

* This artery is regular, in ſo far as relates to the ſcapula, but in its origin it is quite irregular. This great artery going over the ſcapula, named Supra-Scapular artery, or Arteria Dorſalis Scapulæ, moſt commonly comes from within the cheſt, being the firſt great branch of the Thyroid Artery; ſometimes it proceeds from the Cervicalis, or artery of the neck; ſometimes it comes off upon the outſide of the cheſt; it makes large inoſculations, and is the branch particularly to be depended upon; but all the cervical arteries aſſiſt with their leſſer inoſculations, and all of them, or any one of them, may be ſo enlarged as to perform this office of filling the trunk of the artery below the axilla, and ſo nouriſhing the artery.

ly appropriated, that it is called Articularis, or Circumflexa Humeri, from its courſe round the joint; while the ſupra-ſcapular and ſub-ſcapular arteries nouriſh all thoſe muſcles which lie upon the ſcapula, this artery ſupplies the deltoid muſcle, the ſhoulder joint, and the arm bone. Such is the ſize of theſe arteries, the frequency of their inoſculations, and the fleſhineſs of the joint, that injections paſs eaſily from the ſubclavian artery into the humeral artery, although the intermediate part of the trunk, viz. the axillary artery, be tied. Often, when we have tied both axillary arteries with the deſign of injecting only the head, we find that even our coarſeſt injection has paſſed freely into the artery of the arm; and thus that point of the circulation which ſurgeons have been moſt doubtful of, is perfectly enſured *.

Next, when the artery paſſes the border of the axilla, and takes the name of Brachial Artery, it gives off one or two branches, which reſemble the profunda femoris, as far at leaſt as an analogy can hold betwixt ſo bulky and ſo ſmall a limb. Theſe arteries are called Muſcular Arteries of the arm, or Muſcular Spiral Arteries, from the ſpiral form in which the uppermoſt of the two twines round the arm; they are named Profunda Humeri, ſuperior and inferior, from the analogy of the femoral artery; they are named ſometimes Collateral Arteries, becauſe they run parallel with the trunk of the humeral artery. Theſe two arteries terminate in twigs, which encircle the naked and bony joint of the elbow. One curls round the inner condyle, and the other (the muſcular ſpiral), which by paſſing round the arm has got to the outſide of the arm, twines round the outer condyle. Theſe arteries are long, ſlender, of the ſize of crow quills; the twigs they diſtribute round the elbow joint are ſmall and curling. Along with theſe there

* Whether the great artery be wounded juſt where it comes from under the clavicle, i. e. betwixt that great branch which goes over the ſcapula and that which goes round the ſcapula from below; or whether it be wounded betwixt the lower ſcapular artery and the *profunda*, ſtill the limb is ſafe; we are aſſured of it by caſes; we foreſee the ſucceſs of all ſuch operations by the ſucceſs of our injections; I have often found, that when, even in the oldeſt ſubjects, I had puſhed injection (of the coarſeſt kind), from the arch of the aorta, trying to ſave the arteries of the arm for a ſecond injection, by tying both arteries in the axilla very ſecurely, I have, notwithſtanding, had an injection of the arteries of the arm; ſometimes in both arms, more frequently only in one; but even one experiment of the kind, and one arm injected, were a ſufficient proof.

And you will be inclined to conſider this proof as a very ſtrong one, when I inform you that our coarſeſt injection goes thus freely round the inoſculations of the ſhoulder, (where we are ſo much afraid of performing an operation) while even tepid water will not paſs, or will ſcarcely paſs round the inoſculations of the elbow, where, in our operations for the common aneuriſm, we are ſo ſure of ſucceſs.

goes a branch round the inner condyle, which comes off from the humeral artery about three inches above the elbow, near the middle of the arm; it deſcends towards the inner condyle, it is ſlender and tortuous like the branches of the profunda, and it is diſtinguiſhed by the name of Ramus Anaſtomoticus Major. Theſe three arteries then twine round the ſeveral projecting bones which form the elbow joint. The humeral artery having reached the bend of the arm, divides into the three well known arteries, the Radial, Ulnar, and Interoſſeous arteries; they reſemble the three arteries of the leg, and each of theſe ſends back a little artery, which, turning quickly round the elbow joint in a retrograde courſe, mixes its branches with thoſe of the ramus anaſtomoticus and of the profunda. Theſe are named the Recurrent Arteries, and they are the arteries which ſupport the limb after the common operation for aneuriſm in the arm. We ſee and feel the actual enlargement of the artery which ſupports the limb, and it is uſually that branch which I have repreſented in the Plan *, and it adds ſtrength to the general concluſion, that while the inoſculations of the large and fleſhy joint of the ſhoulder tranſmit our coarſeſt injections, thoſe inoſculations of the elbow joint hardly tranſmit tepid water in their natural and undilated ſtate, and yet never fail to ſupport the circulation of the blood after the operation for aneuriſm.

This is the economy of the arteries of the arm, and theſe the inoſculations upon which we have now learnt to depend with perfect confidence; but this is a degree of boldneſs which we have acquired by very ſlow degrees. It is principle alone, and the ſtudy of the arteries that can give us confidence; and the ſtudy of the arteries, eſſential as it is to the practice of our profeſſion, has been entirely neglected by ſurgeons. The inoſculating arteries have been obſerved only by profeſſed anatomiſts, and that very ſlightly. So little have ſurgeons acted upon principle, that when any important queſtion of this kind has preſented, the concluſion has always been, "Let us try whether the inoſculations will ſo enlarge as to ſave the limb." Wounds of the femoral artery were always conſidered as fatal to the circulation of the limb, which was accordingly cut off: The operation for aneuriſm of the ham was, from miſmanagement and bad ſurgery, almoſt always fatal: In wounds of the axillary artery there was no queſtion made, the limb was cut off without delay. It was many ages before ſurgeons ventured to tie the artery, in aneuriſm, at the bend of the arm: For a long time after they did perform the operation,

* The Recurrens Ulnaris, ſee Plans of the Arm, which are ſketched in the General Plans of the Inoſculations, which is placed oppoſite to page 248.

AXILLARY. ARTERY.

*a* the Axillary Artery
*b* Supra Scapular Artery.
*c* Subscapular Artery.
*d* Subscapular Artery, bending under the Scapula.
*e* the Arteria Circumflexa or Artery of the Shoulder Joint.

BRACHIAL. ARTERY.

*f* Trunk of the Brachial Artery.
*ggg* Muscular branches to the Biceps and Brachialis Muscles.
*h* Arteria Profunda Superior.
*i* Profunda Inferior.
*k* Ramus Anastom.ˢ Major.

C Bell delᵗ

Lizars Sc.

it was done with great fear and anxiety, and they kept the amputation-inſtruments ready at hand, that they might cut off the arm the moment it began to gangrene! although this much dreaded gangrene, in the courſe of nearly a century (during which we have continued to perform this adventurous operation), has never once appeared. When this operation did ſucceed, the older ſurgeons wondered at their own good fortune, and aſcribed it to one of two cauſes, either that the branch only of the humeral artery, viz. the ulnar artery was wounded by the lancet, and not the trunk! or, that the humeral artery divided near the ſhoulder, far above the place of the wound! That the trunk itſelf was wounded, tied, obliterated, and yet the arm ſaved, they could never believe; even repeated ſucceſs could hardly inſpire them with confidence. Where is the caſe related in which gangrene followed from the interruption of the blood! Nowhere. And yet, to this day, the arm, after ſuch an operation, is laid in particular poſtures, and wrapped in flannel and furs, and fomented with ſpirituous embrocations, all to reſtore the circulation! as if the ſurgeon could perform, or even promote that proceſs which nature alone can atchieve, and has indeed very carefully provided for. The ſurgeon's ſelf-approbation, when the heat of the limb revives, is like the pride of the fly on the chariot wheel. He puts his oar in the water, but he is carried by the tide and the ſtream *.

Heiſter believed, that wherever we cured the aneuriſm of the arm by tying the artery, the arm was ſaved by a high forking of the artery, and it was only latterly that he began to ſuſpect that the ſmaller branches might ſometimes be ſo far enlarged as to carry the blood freely; becauſe he had occaſionally obſerved, that after the operation for aneuriſm, there was no pulſe in the wriſt during three days, after which it began to be perceived, and ſoon returned to its natural ſtrength †.

* We find the celebrated Ruiſh ſpeaking of this operation in the following terms: "This is an operation which ſurgeons choſe rather to deſcribe than to perform. I have good reaſon to ſay ſo, ſince for more than twenty years, in all this great city, to which ſo many under all kinds of ailments crowd for aſſiſtance, no ſurgeon, as far as I have heard, has ventured to tie ſo great an artery."

It is commonly ſaid, that Ruiſh was actually the firſt who had performed this operation in Holland; whereas the paſſage ſtands thus: "Operationem ſane ab authoribus majus commendatam et laudatum quam inſtitutam; quod dicere non gravor, quia viginti abhinc annis, et quod excurrit in hac vaſta civitate, ad quam ſine numero confluunt afflicti, hanc operationem in arteria adeo ingenti nullus (quantum noverim) chirurgorum inſtituit." Ruiſh, Vol. I. Obſerv. 2.

† "Poſſe vero ramulos minores ſe ita ſenſim dilatare, ut § XXXVIII. diximus, Clar. Du. Præſes inde ſuſpicatur, quia cum aliquando truncum arteriæ brachialis internum, graviter vulneratum, prædicta ratione ſupra vulnus ope fili circumdicti ligaſſet, intra triduum nullum in arteria juxta carpum poſita, quæ à medicis

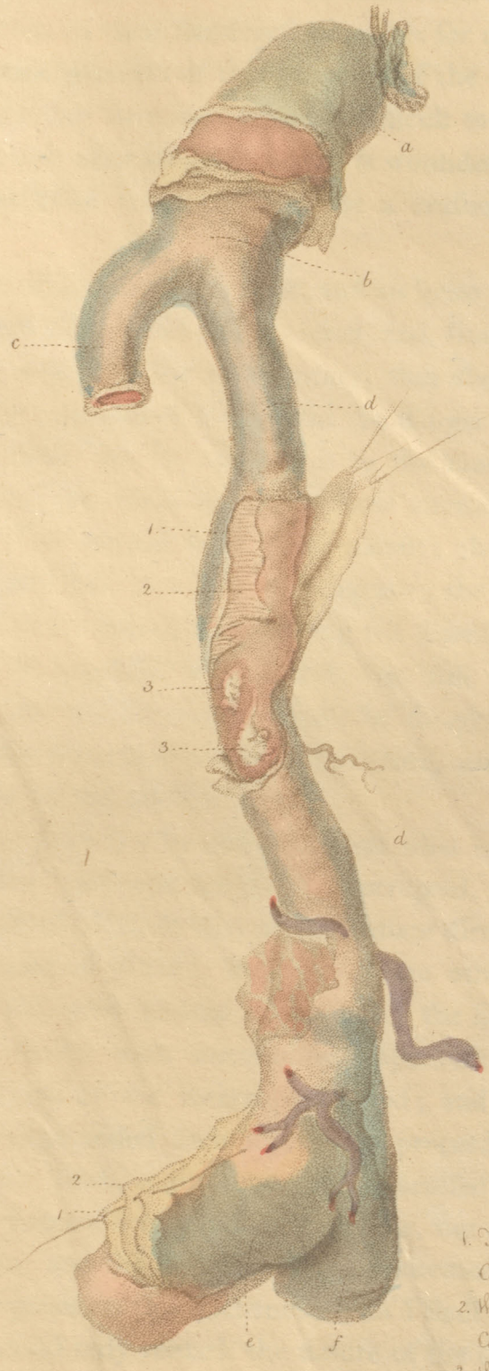
" If the axillary artery be wounded (ſays Mr. Gooch) it is neceſſary to take the limb off at the joint; yet as there are inſtances of the brachial artery dividing into two, ſoon after it leaves the axilla, which luſus naturæ I have obſerved at different diſtances in the arm (for Mr. Gooch had a natural turn for obſerving theſe luſus naturæ), it will be rational practice when we feel a pulſation at the wriſt, to treat ſuch caſe as an aneuriſm, by tying the artery," &c. P. 72.

In ſhort, there were two accidents with which the older ſurgeons encouraged one another to this operation, viz. firſt, that the artery forked very high in the axilla; or, ſecondly, that in common an artery touched with the lancet in bleeding, was pricked not in its trunk, but only in one of the two branches into which it divides at the elbow. Thus Cheſſelden ſays, " I had always thought this wound was in the inferior cubital (i. e. in the ulnar) artery, and thus the ſudden reflux of the blood was accounted for, by the communication of the two cubital arteries in the palm of the hand, and thus ſatisfied, I inquired no further; though Mr. Sharp, even ſo long ago as when he was my apprentice, told me that the wound was in the trunk, in the humeral artery itſelf, as indeed it is." P. 457. And yet the celebrated Dr. William Hunter, notwithſtanding this affirmation of Cheſſelden, lays it down in the moſt formal poſitive manner, in the ſhape of a practical rule or inference, we know not what to call it, marked xv. " That though the brachial artery in moſt people divides into its two branches a little below the part where we commonly bleed; yet perhaps it will be found, that the aneuriſm happens oftener to one of the branches than to the trunk of that artery, becauſe theſe often lie nearer the ſkin, and are thereby more expoſed to injury." P. 353.

This has nothing in it of the uſual correctneſs of Dr. Hunter, for in point of fact it is wrong; the branches do not lie nearer to the ſkin, they are buried deep, not under the faſcia only, but under the bellies of the pronators and flexors of the arm, and any one may know this, who has ever in his life tied up an arm for bleeding, where he muſt have obſerved the artery beating ſtrongly only where it is undivided, where it runs in one trunk under the median baſilic vein. Dr. Hunter's reaſoning is even more miſtaken than his aſſertion; for if in moſt people the artery divide a little below the place where we bleed, it matters little whether below that point the two branches be ſuperficial or deep, the aneuriſm cannot happen " oftener to one of the branches than to the trunk."

explorari ſolet, pulſum ſentire aut percipere potuit: poſthæc vero hanc arteriam, primo leviſſime micare, ſenſim vero ſenſimque penitus pulſare ſenſit."

Drawing of Diseased & Ossifying Artery - its Cellular Substance thickened and its Coats seperated from one another.




a. the Aorta
b. its Bifurcation
c. the Stump of one Iliac Artery
d. the whole length of the other Iliac Artery
e. External Iliac or Femoral Artery
f. Internal Iliac or Hypogast.c Artery

1. The External Cellular Coat of the Artery
2. the Middle or Muscular Coat
3. the Internal or Villous Coat Ossifying

C. Bell del.

The more we inveſtigate theſe arteries and their inoſculations, the greater reaſon ſhall we find to truſt even in their ſlendereſt branches for the nouriſhment of a limb. Surgeons have been ignorant of this property of the circulating ſyſtem. It is by neglecting anatomy that they have found it difficult to imagine, a priori, how a limb ſhould be ſaved after its great artery is wounded, and they never could deduce ſuch a concluſion from practice, for a reaſon which I am now going to aſſign.

It often happens that a limb is cruelly wounded, and its great artery at the ſame time cut acroſs; this appears as the moſt fatal accident, and, from the moment that the ſurgeon knows of the wound of the main artery, that alone dwells upon his mind. He anounces to the relations of his patient the danger of gangrene, and when the gangrene does come on, he aſcribes it to the cauſe which is uſually aſſigned, the mere wound of the main artery, without attending to the complicated nature of the caſe! The wound is of great extent; the limb is bruiſed, and, almoſt from the firſt moment, in a ſtate of gangrene; the bones are broken, and the blood of the great artery driven deep among the diſordered and lacerated parts. The limb perhaps is wounded with a ball, but ſtill the wound of the great artery alone dwells on the ſurgeon's mind; he forgets the diſorders and natural dangers of a gun-ſhot wound or compound fracture, and imputes the gangrene merely to the wound of the arterial trunk.

The condition of ſuch a limb is very different from what is uſually ſuppoſed: When the artery is wounded, tied, and the blood interrupted, it is imagined that the limb is deprived of blood; that it dies of immediate direct gangrene; that the gangrene is from the want of blood! But it is quite otherwiſe; the whole arteries are thrown into the moſt violent excitement; the limb is gorged with blood; its arterial ſyſtem works with uncommon impetuoſity; every twig is dilated to carry its proportion of the interrupted blood; and if to this gorged condition of the limb are ſuperadded ſuch injuries as proceed from the paſſing of a waggon-wheel over the limb, a gun-ſhot wound, bruiſed fleſh, and broken bones, there cannot fail to happen a very ſudden gangrene, but not without a previous ſtage of inflammation, and the higheſt poſſible excitement of the limb.

Much of our practice depends on this doctrine, which I ſhall afterwards explain more fully; at preſent I would only remark the nature of the deception to which the ſurgeon is ſo much expoſed.

If a man will look only ſuperficially on theſe matters, or will be ſatisfied with

general concluſions deduced from the accidents of only one particular caſe, then indeed he will be hurried along into this raſh practice of cutting off arms as well as legs: Or, in other words, if to eſtabliſh this rule of ſurgery, nothing more were required than an authentic caſe of a wounded axillary artery, followed by gangrene and death, ſuch proofs might be found in every common book. Thus Mr. Gooch tells us, p. 76. " That he was called by a neighbouring ſurgeon to attend along with him a man who had been juſt before, in a ſtate of exceſſive intoxication, thrown from his cart, the wheels of which had paſſed over the top of his arm and ſhoulder, bruiſing all the parts quite up to his neck, while an iron hoop, projecting from the cart, had cut him under the arm, tearing fairly acroſs the artery and all the great nerves which go down along the arm."

" The limb was wholly deprived of ſenſation and motion, they felt no pulſe at the wriſt, and they concluded that the brachial artery was divided, although the bleeding which was at firſt profuſe, had ſtopped, partly by the retraction of the artery, and partly by their having tied down his arm to his ſide."

" Had not the drunken condition of the patient, and the violent contuſion of the parts ſurrounding the joint, diſcouraged us (ſays Gooch), we ſhould have propoſed immediate amputation at the joint. The next morning the arm appeared in different parts diſcoloured, emphyſematous, and gangrenous; by noon it was totally dead and inſenſible to the finger-ends; and on the third day, towards the evening, the patient expired. The day after his death, the arm was ſo thoroughly putrid that we were unable to diſſect it, till after having waſhed it well with warm vinegar and ſpirits, we opened it, and found the bundle of the great nerves entirely cut acroſs, and the artery alſo divided, and its upper end retracted an inch into the axilla." But this, far from being a general proof, is an accident merely: The death of this perſon is explained by the general circumſtances of the caſe; the inebriation of the patient, his loſs of blood, the cutting of the whole bundle of axillary nerves, are of themſelves ſufficient to account for his death. Perhaps he died as Captain M—— did (whoſe caſe is related by the celebrated Mr. White), rather from his inebriation, loſs of blood, and wounded nerves, than from the neceſſary conſequences of his wound; for Captain M——'s arm preſerved its circulation; its heat had returned; the vein ſwelled upon putting a ligature round the arm; he died after the arm was ſafe from all the conſequences of the tying the artery.

But this caſe, related by Mr. Gooch, was complicated with other accidents;

for we are told that they were deterred from amputation, by the bruiſed condition of the parts ſurrounding the joint. The wheel had paſſed along the arm and ſhoulder quite up to the neck; theſe parts were black; and, I dare ſay, little better than gangrenous: Is it at all ſurpriſing, that an arm ſo mangled, upon a body ſo hurt and diſordered, fell into immediate gangrene?

Hence we ſee the folly of deducing any general concluſion from an individual caſe, and we are reminded of this good rule in philoſophy, that one poſitive evidence muſt outweigh any number of negative proofs. If we can find but one ſingle example of an axillary artery wounded, and the arm ſaved, it is then a ſettled point, that in favourable circumſtances the inoſculating arteries round the ſhoulder will ſave the arm; and the concluſion will ſtand firm; though there ſhould be produced againſt that ſingle recovery a whole hoſt of negative proofs they will ſignify nothing. It evidently becomes our duty, whenever we are preſented with a caſe ſeeming to contradict this poſitive proof, to inquire into the circumſtances and accidents which have made that one caſe fail, while another operation has been followed by ſuch perfect ſucceſs. As the pureſt caſe, the leaſt complicated, and the moſt unequivocal example of ſucceſs, I put down the following.

" About ſixty years ago, Mr. Hall was called to a man in Cheſhire, who had received a very conſiderable wound, juſt below the axilla, by a ſcythe which had divided the brachial artery. The man ſoon fainted away with the loſs of blood, which preſerved his life, as nobody was near him. Mr, Hall, being only accidentally in the neighbourhood, had no needles with him; but as ſoon as he arrived, he eaſily laid hold of the artery with his finger and thumb, till he could procure ſome thread, which he immediately tied round the veſſel, and effectually ſecured it. The *man recovered the uſe of his arm;* though he had ever after a weak and trembling pulſe *."

It was the broadneſs and openneſs of this wound that enabled the ſurgeon to ſee the bleeding artery, and to take it up ſo fairly, as to ſave at once both the life and the limb of the patient; for in many other caſes, it has only been by conſenting to loſe the limb that the patient has ſaved his life; or where the limb has been ſaved from amputation, it has in general hung, ſhrunk, lifeleſs, by his ſide †.

* Vid. White's caſe of Captain Mounſey.

† It was more than ſuſpected more than a hundred years ago, that in aneuriſms of the brachial artery the veſſel might be tied even in the axilla, without danger of gangrene. " Imo poſſe conſtringi filo trun-

If it were worth while, I would carefully explain the chief accidents of this kind, ſo as to prove the following poſitions: That the wound of the axillary is leſs dangerous ſtill than wounds of the femoral artery; that when gangrene has ſeemed to proceed from a wound of the axillary artery, it has been owing rather to the complications and accidents of the caſe; that when, together with a wound of the artery, the bones are fractured, or the ſoft parts bruiſed, as with a waggon-wheel, the cure will be almoſt impoſſible, and the parts muſt fall into gangrene; that where, by the force of the artery driving the blood inwards, the cellular ſubſtance and the interſtices of the muſcles are filled, or (as I may ſay, rather) injected with blood, we ſhall have a ſlow and tedious cure; that if the inoſculating arteries be torn in a lacerated wound, or their circulation diſordered and interrupted by a high inflammation and ſwelling of the parts, that alſo will make a very doubtful caſe, and in thoſe circumſtances it muſt be dangerous to attempt the cure. But all theſe do not belong to the general queſtion; they are merely the peculiarities of the individual caſe; they are indeed the very points to be debated in any great conſultation; but they are not arguments for a general rule. Let, therefore, the ſurgeon do as he ſees prudent in caſes of wounded arteries, with lacerated fleſh, broken bones, a diſordered ſyſtem, a weakly habit of body; but on no account ſhould he allow himſelf, in a ſimple wound of any great artery, even to conſult about cutting off the limb.

From this pitiful timidity, the moſt horrible, and, I may ſay, unnatural things

cum arteriæ axillaris, ſupra præcipuas illius bifurcationes ſi inibi aneuriſma excitatum fuerit, procul a metu necroſis membri ſubſequuturæ vel alterius ſymptomatis; id quod poſtremo notum eſſe volui Dom. de Bligni et aliis." MORELLUS, *Noſodochii Charitatis*.

Thus, the communications of Sharp, Cheſſelden, and Le Dran, on this ſubject, loſe much of their value. This was not a mere doctrine, the theory thus delivered, and indeed anxiouſly inculcated by Morellus, was backed with facts. The following caſe is remarkable: "A young man having been wounded in a duel, on the fore part of the arm, had the artery and vein cut acroſs near the axilla. The hæmorrhagy was dreadful, and knowing well that it could not be repreſſed by aſtringents, I had recourſe to the ligature, in the following manner: I paſſed a large crooked needle through the ſound part above the wound, driving it ſo deep that it went cloſe to the bone; it pierced the long extenſor (viz. the long head of the triceps), and it paſſed through the belly of the biceps on the fore part of the arm. The ligature was very ſtrong; ſo placing a compreſs on the ſkin to prevent it cutting, I drew it hard, till it fairly compreſſed the artery and vein. There was no further hæmorrhagy, and the man did well." Though this be but a coarſe buſineſs, yet the ſucceſs is flattering, and is good evidence on this intereſting point of practice. The caſe is related by Mr. Samuel Formi, a ſurgeon of Montpelier.

are done; a man having an aneuriſm is abſolutely allowed to bleed to death, after nature, unaſſiſted and alone, has almoſt accompliſhed the cure.

* "A ſoldier of the 3d regiment of Foot Guards perceived a ſwelling in his axilla for which he could aſſign no cauſe. The ſurgeon of his corps knew it to be an aneuriſm. The tumor increaſed ſlowly for nine or ten months. His ſurgeon, unwilling to adventure upon a deſperate operation, had him conveyed to St. George's Hoſpital. The tumor then had acquired a very great ſize, had extended itſelf from the axilla far down the arm; it ſtill had ſome pulſation, but the pulſe at the wriſt was weak and feeble. "The regimental ſurgeon, and the phyſicians of the Hoſpital, thought the tumor was ſituated too high up to attempt any operation." When they had pronounced this ſentence of death, they recommended palliatives and anodynes.

"It was in October that he was conveyed to the Hoſpital; he lived on to the end of November or beginning of December, when the tumor began to riſe in the middle, and at laſt it burſt on the 29th of December, and the patient died of a profuſe hæmorrhagy.

"Upon diſſecting the body, the tumor was found to extend above two-thirds down the arm; the axillary artery opened into the ſac, the artery itſelf being undilated and ſound; the walls of the ſac ſeemed to be continuous with the coats of the artery; the ſac itſelf was filled with large lamellated polypous concretions; and, along with theſe, a quantity of fluid and grumous blood. The lower part of the humeral artery lay behind this aneuriſmal ſac, and was quite impervious for half an inch; for, juſt below where the arterial trunk opened laterally into the ſac, the continued trunk of the artery was quite obliterated by the adheſion of its ſides."

From the circumſtances of this diſſection, we cannot doubt that the main artery was entirely obliterated. From its being cloſed by "an adheſion of its ſides," we are aſſured that this obliteration of the artery had been ſlow and gradual. From "the reſt of the humeral artery and the radial and ulnar arteries being ſtill open, but much ſmaller than they commonly are in adult ſubjects," we are aſſured that the change in the circulation, ſo deſirable, and yet ſo much dreaded, had actually taken place, the main trunk of the artery had been entirely cloſed, while the arteries below had been more ſparingly filled by the inoſculat-

* For the following caſe, ſee a paper on Aneuriſms, by Dr. Monro, Edinburgh. Eſſays Phyſical and Literary, Vol. III. p. 196.

ing branches. We are, moreover, aſſured (from the following obſervation), that the circulation through the inoſculating arteries was fully eſtabliſhed; that they had continued to ſupport the arm for a month. "This ſwelling gradually increaſed, and its pulſation as gradually diminiſhed, ſo that at laſt only a tremulous motion could be obſerved in it; the pulſe in the wriſt grew daily weaker, and at laſt ceaſed entirely; in the *end of November*, or *beginning* of December, the tumor began to riſe in the middle, and on the 29*th of December* it burſt, and he died of the hæmorrhagy."

What a ſad picture is here of the ſtate of ſurgical practice in the greateſt and nobleſt hoſpital in London! The tumor compreſſes the humeral artery two-thirds of its length; the tumor itſelf is obſtructed with coagula; the tumor loſes its pulſation, and the blood ceaſes to paſs through the artery. Then the pulſe of the wriſt becomes ſmall and fluttering, it ceaſes at laſt, and yet the arm continues to live; the proceſs of obliteration is ſlow, but it is ſo complete, that the ſides of the artery adhere, the arm ſurvives this change in the circulation a whole month, perhaps more; and yet, when the aneuriſm burſts, the ſurgeons allow the patient to expire from loſs of blood! What is our profeſſion good for, if we are to allow ſuch a patient to die? if we refuſe a patient thoſe means which Nature has appointed for ſaving life? Surgeons and phyſicians, deliberating with abſurd formality about inoſculating arteries, might reſolve thus to let the patient expire, but his honeſt and ignorant friends would not have done ſo; with common ſenſe only to direct them, and full of the natural feelings of humanity, they would have judged that nothing worſe could happen him than to die, and would no doubt have tried to ſtop the blood!

## OF THE GENERAL EFFECTS OF INOSCULATION, INVOLVING SOME GENERAL DOCTRINES IN SURGERY.

While I inſtruct you more particularly in the doctrine of aneuriſms, I muſt not forget that I am teaching you the general principles of ſurgery. This doctrine of inoſculations is to ſerve you as a ſort of general theory of aneuriſms, and before I leave this ſubject, I will take notice of ſome peculiarities in the actions of the extreme arteries and in the general circulation of the blood, which depend

in ſome degree upon the inoſculation of veſſels one with another; for inoſculations are not mere accidents, but are eſſential to the health of the parts, and deſtined for more important purpoſes than are uſually ſuppoſed. This frequent inoſculation of veſſels cannot be intended only for diſeaſe. Diſeaſe makes thoſe inoſculations apparent, and gives us an intereſt in them, ſince it is on them alone that we depend in our moſt dangerous operations; but it is ſurely to be ſuppoſed that the inoſculations ſerve, even while the body is ſound, ſome important purpoſe; we have reaſon to believe, that in health as well as in diſeaſe the blood often moves in the limbs and in the viſcera, not in a direct, but in a retrograde courſe.

According to the old doctrines of phyſiology, the blood could move no way but directly onwards by the impulſe of one central power, the contraction of the heart, and return in its courſe to the heart by the veins, moving ſtill onwards in one direct circle. This idea was quite familiar with the old phyſiologiſts. They conſidered the whole body, the arteries, and veins, and glands, and viſcera, with all the apparatus of ſecretion and excretion, as a mere hydraulic machine, conſiſting of elaſtic tubes, ſubject to the laws of fluids in motion. The heart they regarded as the ſole moving power, and its ſtroke as the ſole impulſe by which alone the blood was urged onwards to the extremities of the ſyſtem; and as they delighted to adorn Nature with powers of their own imagining, they waſted much ingenuity in explaining the power of the heart, and took a pleaſure in calculating, and in exaggerating the force of that muſcle: They proved, indeed, that its powers muſt be infinite; for having firſt aſſumed as a principle that it was the ſole mover, they proved eaſily that the reſiſtance muſt increaſe, and the effect of this central force be abated the further each part of the body to which the blood was propelled was removed from the centre. They ſaid, the heart had to force onwards a vaſt column of blood, that it had to overcome the elaſtic reſiſtance of the arteries, to unfold all their tortuous branches, and to puſh the blood onwards to their extremities through all their intricate convolutions, through glands, viſcera, and the various ſecreting organs; that this column of blood muſt be moved in oppoſition to the power of gravitation in raiſing it to the higher parts of the body, and that it muſt be moved through all parts of the body in oppoſition to the weight of the parts themſelves, and to the preſſure of the atmoſphere. They never accounted as any thing the contractile power of the veſſels; they never reckoned the arteries as an aſſiſtance to the heart; they regarded the elaſtic power of the veſſels rather

a dead weight upon the heart, as oppoſing it; they never ſuppoſed that force which urges on the blood to be diſtributed equally through the ſyſtem; they imagined the whole power to reſide in the centre; and the whole ſyſtem of veſſels as in direct oppoſition to this central power.

Thus, in their zeal to magnify the propelling power of the heart, they continued to enumerate the reſiſtances which it had to overcome, till they proved a ſum of reſiſtance ſuch as no ſingle part, however great its power, could be ſuppoſed to overcome; and very erroneous were the concluſions which reſulted from thoſe premiſes. It was conjectured that the motion of the blood was ſlower and more difficult as it receded from the heart; that it was very languid in the extreme veſſels, whence obſtruction and gangrene were frequent in the extremities; obſtructions, inflammations, fevers, and all diſeaſes, were deduced from a ſlow tranſmiſſion of the fluids, ariſing from viſcidity, tenacity, and error loci, or in other terms, from the particles of the blood entering into arteries unfit to receive them. Thoſe phyſiologiſts never aſcribed any active diſeaſe to the living power of the veſſels, to the enlargement or increaſed action of particular arteries. Inflammations, tumors, and aneuriſms, they aſcribed to ſuch weakneſs of the parts that the power of the heart was enabled to prevail over them and dilate them.

When a limb was cut off, they were fearful leſt the heart ſhould prove too powerful for the more limited circle it had to ſupply with blood; and they bled regularly for ſome months, after great amputations, in order to leſſen the power of the heart over the arteries, and to prevent the burſting of the veſſels of the ſtomach or lungs. They believed, contrary to their daily experience, that an artery could not be tied without danger of being dilated by the force of the heart, and for this reaſon refuſed to tie up the great arteries in aneuriſms of the limbs. All diſeaſes were explained by the words lentor, remora, viſcidity of the blood, obſtruction in the extreme veſſels, or irritation and febrile action in the heart. They proceeded in their calculations upon the pure principles of hydraulics, without ever regarding the veſſels of the living body as alive. They conſidered the circulating ſyſtem as a ſet of elaſtic and inactive tubes; and Keil the anatomiſt, and his brother the aſtronomer, calculated the laws of the circulating fluids, and deduced the motions of the animal fluids, the ſecretions, the perſpiration, and all the phenomena of health and diſeaſe, from this miſtaken principle, from this petitio principii, "That the various velocities of the fluids are proportioned to the various diſtances of the ſeveral organs from the heart!"

Nor have modern phyſiologiſts entirely changed the ground. It is upon the ſame principle that the moſt celebrated phyſiologiſts of the preſent day have attempted to calculate the power of the heart. They have aſſumed, "That the power of the heart and the mechanical ſtrength of the arteries have a juſt proportion to each other, that by aſcertaining the one, we may gueſs at the other." It is upon this petitio principii that they have propoſed from the mechanical ſtrength of the arteries to calculate the impulſive power of the heart! But is it really an artery whoſe ſtrength they are thus endeavouring to aſcertain? When they take a portion of a great artery to compare it with a portion of a ſmall one, or with a portion of a vein; when they ſtretch it out in their air pump, expoſe it to the preſſure of the atmoſphere, and meaſure, according to the deſcent of the mercury, the exact force it is capable of bearing! is it really an artery whoſe ſtrength they are calculating? No; it is a part of a dead body, a piece of leather, a ſtrip of parchment; "it was an artery;" it was once a muſcular artery, endowed with living powers, capable of contraction when ſtimulated, capable of great contractions when highly excited, and of great reſiſtance when much extended, of various ſtrength, according to the health of the body! but now that it is dead, it has but one invariable power, that of coheſion, the mere property of dead matter, proportioned only to the denſity of its coats. It is to be remembered, that a muſcle which could lift great weights when alive, will bear but a very ſmall one when dead; this power of the living muſcle has no ſhare in theſe calculations, it is indeed incalculable.

Whatever has been imagined by theſe mechanical phyſicians reſpecting the circulation of the blood, has been contradicted by experiment. The motion of the blood, far from being retarded in proportion to the diſtance of the parts from the heart, is more lively and rapid in proportion to the ſmallneſs of the arteries. The blood in the tail of a fiſh, for inſtance, without being urged onwards by any vis à tergo, continues for ten minutes after it has been ſevered from the body; and in many animals the circulation of the blood in the meſentery ſurvives for a little while the ſeparation of the heart from the ſyſtem. The blood, while the parts are entire, does not move always in the ſame direction with that which iſſues from the heart. The circulation of the blood is by no means commanded by the power of the heart, it is eaſily diſturbed; a ſlight accident or obſtruction makes the arteries turn the tide of the circulation into a retrograde courſe directly oppoſite to that impulſe which it receives from the heart; for, when you open a veſſel, the blood runs

from both ends, and returns by a retrograde courſe from all the adjoining veſſels to the wounded part. When you ſtop an artery, the blood runs backwards in it, forſakes the obſtructed artery, and paſſes along other arteries in a backward courſe. In ſuch circumſtances the blood is not driven in this retrograde courſe by the force of the heart, but by the action of the arteries, which are thus emptied of their blood. There are ſome inſects in which we ſee only a muſcular aorta working the blood along, and there have been born monſtrous fœtuſes having no heart, whoſe blood, of courſe, had been circulated merely by the muſcular power of the aorta. Fiſhes have three ſucceſſive circles of blood; one circle for the lungs, through the bronchial arteries; a ſecond through the body, by a muſcular aorta; and the blood of this ſecond circle is urged a third time through the circulation of the liver by a vena porta, without any intermediate heart. Succeſſive circulations are thus performed merely by the muſcular power of the veſſels.

Now while lymphatic veſſels, veins, the glands and their ducts, the hollow viſcera, the urinary bladder and urethra, the vagina and womb have ſuch contractile powers, why ſhould we ſuppoſe the ſame power wanting in the arteries, which are more plainly muſcular than any of all theſe parts? The perpetual reſiſtace to the circulation, as the veſſels recede from the heart, ſhows the neceſſity of a propelling power univerſally diſtributed and not limited to one central point; and the rapid circulation of the blood in the extreme veſſels, its occaſional aberations, the oſcillations of the blood running ſometimes in one direction, ſometimes in another; the effect, eſpecially of inoſculating arteries, and the manner in which parts grow both in health and in diſeaſe, prove ſufficiently that each department of the circulation, in the various limbs, parts and organs of the body, is carried on by the contractile power of its own veſſels.

The heart is ſtill the prime mover of the circulating ſyſtem, its office is to excite the arteries by its ſtroke, to keep them full, to receive from the veins which are, as it were, the reſervoirs of the blood, that exact quantity which the arteries require for their full and perfect action, and to propell it into the general ſyſtem. But the velocity of the circulation is greater or leſs in each part, not according to its diſtance from this active centre, but according to the nature of its function, according to the ſort of veſſels with which it is endowed, according to the excitement which the part ſuffers, independently altogether of the general force of the circulation. Thus does general circulation contribute to every partial and local action, by ſupplying each individual ſet of veſſels with blood, giving them

the ſtimulus of fulneſs, preſerving a due excitement in the veſſels, and preventing any retrograde motion of the blood when the extreme arteries act upon it. The general circulation preſents the materials to each organ, but leaves it to work out its own peculiar function, and the irregularity of all the ſecretions and actions, ſhows how much theſe depend upon the excitement of the organ and upon partial contraction of the veſſels, how little upon the general circulation. Thus, bluſhing of the cheeks and erection of the penis, are examples of partial actions of veſſels, independent of the general circulation; ſecretions of every kind, oſſification, and the nutrition of the ſoft parts are examples of appropriated veſſels acting towards particular purpoſes, independent of the general ſyſtem. And atrophies and waſtings, inflammations, ſwellings, and tumors, hæmorrhages and profuſe diſcharges, afford examples of the too weak or too powerful action of particular ſets of veſſels.

It may, I believe, be received as a principle of the circulation, that in whatever way the demand of blood upon any artery, or ſet of arteries, is increaſed, the effect is an accelerated motion of the blood towards that artery. Of this, perhaps, the plaineſt example is that of the varicoſe aneuriſm, where a ſide paſſage is opened from the artery directly into the vein, where the arteries of the arm continue to require their uſual ſupply of blood, and where this loſs of blood by the ſide paſſage of the artery, and the dilatation of the vein makes a new demand upon the trunk. The trunk of the brachial artery enlarges, becomes tortuous, and acts more powerfully to ſupply this new demand, and the enlargement of the artery is eaſily felt even through the ſkin.

Every demand of blood cauſes enlargement of the arteries leading to the part which demands the blood, and it ſignifies little whether the blood be thus required in conſequence of its paſſing unnaturally from the ſide of the artery into the vein with which the artery is united, (as in this example), or whether it be evacuated from the ſyſtem by many arteries, as in the caſe of hæmorrhagy, or whether it be expended in nouriſhing ſome inordinate growth, in ſupporting ſome tumor, or in generating an aneuriſmal enlargement of certain veſſels! ſtill the effect is the ſame upon the great arteries of the part. A profuſe ſecretion once begun is not eaſily ſtopped. A hæmorrhagy is eaſily eſtabliſhed as a habitual diſorder with a perpetual tendency to return. A tumor once formed never ceaſes to grow, and an aneuriſm once generated diſtends the veſſels continually more and more till it burſts. In every ſuch caſe, it is the partial action of its arteries that cauſes this

influx of blood towards any part; pain and ſwelling in a tumor is preceded by a ſenſe of pulſation and heat, and the return of hæmorrhagy is portended by the beating of the arteries.

When a tumor once begins, it is, as it were, a morbid ſecretion. The arteries begin to depoſite ſolid parts, they ſtrengthen in this morbid ſecretion every day; and being excited to a more powerful action, they daily increaſe their demand upon the parent trunk. This action of the leſſer arteries of the tumor invites more blood into the greater arteries which feed them. The inoſculations of theſe arteries enlarge, and they in their turn draw off blood from all the neighbouring arteries, and thus in every growing tumor, as the arteries increaſe in their ſize, their activity becomes greater, and the ſources from which they derive their blood are multiplied. The ſmaller arteries which perform the morbid ſecretion, the more important branches which ſupply thoſe ſmaller arteries, and the trunk itſelf, which is, as it were, the ſtem of the whole tree, increaſe in ſize.

If a gland be the ſeat of the diſeaſe, each ſubdiviſion and partition of the gland grows by the increaſed power of its own particular artery; it continually increaſes knob after knob, gland after gland, according to the ſucceſſion in which each artery aſſumes this diſeaſed action, till the whole acquires an enormous ſize, the laſt increaſe of the tumor being always in a high proportion more rapid than the firſt. Tumors have no bounds in their growth! the ſmalleſt glands about the jaws grow to the ſize of the head; the teſticle grows to the ſize of the body; aneuriſms increaſe always till they burſt. It is, with few exceptions, the nature of tumors to grow till, according to their various natures, they either fall off from their weight, or become gangrenous and burſt, or oppreſs the adjoining parts ſo as to cauſe death. No tumor ſhould be allowed to grow to any dangerous ſize.

When the arteries of any part are thus ſet at work, while their trunks increaſe in ſize, their veins increaſe in proportion, and this is plainly the reaſon why every tumor, whatever be its nature, is marked with turgid veins and conſpicuous arteries which never were before known to belong to the part. The veſſels being thus increaſed in ſize and power, ſometimes depoſite matter and make a fluid tumor, ſometimes they are determined to the ſecretion of ſolid parts, and ſo form a firm or fatty tumor; and ſometimes, from this increaſed action, proceeds a mere enlargement of the muſcular fleſh! I have ſeen the ſurgeon digging deep and wide into the thickened muſcles of a limb ſearching in vain for matter, and only cutting through firm and quivering fleſh. Frequently veins and arteries work themſelves into a di-

lated ſtate without ſecreting, without evacuating their contents, but forming, by their increaſed action and gradual dilatation, a very ſingular aneuriſm. Thus the excited ſtate of the arteries enlarges the diameters of their canals, and increaſes the ſources of their blood; the arteries and veins work in concert till they begin to pulſate very ſtrongly; their branches are ſo enlarged at laſt, and ſo intricated, as it were, that the ſubſtance of the tumor reſembles a placenta with numerous arteries and veins opening into a ſort of cellular ſubſtance! The tumor becomes livid, and its ſurface pulſates more ſtrongly! the ſkin waſtes, the tumor ſwells up upon ſtraining, holding the breath, or any uncommon action of the arteries or obſtruction of the veins! it burſts from time to time and pours out blood; this is a peculiar kind of aneuriſm, which might, I think, be named aneuriſm from anaſtomoſis, and which I ſhall take an opportunity of deſcribing more fully.

Another conſequence of theſe enlargements is, that the frequent inoſculations of arteries, one with another, which contribute in the healthy ſtate to the free diſtribution of the blood, contribute remarkably in the diſeaſed ſtate to feed the diſeaſe. For when once a ſet of arteries are enlarged, they will have blood, they will draw it from all ſources; though the main arteries were ſtopped up, the collateral arteries would grow into trunks; and though you tied up what you think the principal arteries of ſuch an aneuriſmal tumor, you would find thoſe very arteries filled with retrograde blood, beating ſtrongly when you feel the tumor, and bleeding furiouſly when you cut into it. Another conſequence of theſe frequent inoſculations is, that the force of the circulation in any tumor increaſes not in a direct, but in a geometrical proportion. For the force of the blood or the violence of pulſation in any one given point, is not in proportion to the mere force of any ſingle artery, but to the combined force of all the arteries inoſculating with it. This is one reaſon of the rapid growth in the latter ſtages of this peculiar aneuriſm, of the powerful pulſation in a whole tumor of which the individual arteries are exceedingly ſmall, and of a ſolid tumor often receiving ſo powerful a pulſation from many ſmall arteries, as to be miſtaken for an aneuriſm of ſome arterial trunk.

The ſavage nations give us a curious proof of the eaſe with which veſſels may be excited to an increaſed nutrition, which is indeed an increaſed ſecretion of new parts, for ſimply by exciting the arteries of a part it is enlarged, and ſavages enlarge to an enormous degree the ears, the noſe, the lips, merely by diſtending them. In diſeaſes, we ſee the ovaria in women dilated ſo as to form

enormous bags with firm and fleſhy walls, containing within them various ſacs, ſome filled with the tranſparent waters of a dropſy, ſome with a gelatinous fluid, ſome with grumous blood. And in man, we ſee the ſpermatic cord, for example, lengthened, the peritoneal proceſs thickened, and the teſticle itſelf increaſed in ſize merely by the extenſion of parts, in conſequence of a hernia falling down into the ſcrotum. For ſome very extraordinary inſtances of ſuch enlargement, ſee the Medical Eſſays of my friend Mr. Kite of Graveſend, a gentleman of moſt uncommon ingenuity in phyſics, and of great knowledge and ſkill in his own profeſſion.

The growth of the womb in pregnancy is a conſpicuous example of this increaſe of thickneſs, merely by the dilatation of veſſels and accumulation of blood, produced by an excitement of the veſſels, and an increaſed demand for nutritious fluids. For when the womb becomes pregnant, it is excited, and as it were inflamed, its veſſels begin a new ſecretion, its ſyſtem of arteries is put into action, its veins are proportionably dilated, the form and manner of its growth is determined by the place to which the fœtus is attached, which being commonly at one ſide, the womb grows all to one ſide, and lies almoſt always obliquely in the belly. The growth of the womb is limited only by the demand upon its veſſels, for the ſubſtance of the womb actually thickens as pregnancy advances, and it is, when loaded with twins or with three children, enlarged in proportion. In the enlargement of its arteries and veins, and in the cellular appearance of its internal ſubſtance, the pregnant womb reſembles that kind of aneuriſm which I have juſt deſcribed; when it is cut in the Cæſarean ſection, its bleeding is like that which attends the extirpation of ſuch an aneuriſm, the blood iſſues from innumerable points, and the taking up of arteries with the needle and thread in the Cæſarean ſection is a mere romance.

The growth of the womb in thickneſs is limited to the ninth month, the fœtus is diſcharged, the womb collapſes, the activity of its arteries ceaſes, and thoſe arteries which had been accuſtomed to tranſmit ſuch a profuſion of blood return to their ordinary condition. The growth of the womb is altogether a very ſingular example of this increaſe of veſſels when excited to higher action, for in the womb itſelf, there are actually two parts diſtending at once, the one by the force of the excit d circulation, and the other by mere extenſion! the fundus of the womb has the living Ovum connected with it, has a powerful circulation and thickens as it extends; but the Cervix Uteri, the neck of the womb, has no con-

nection with the Ovum, its veſſels are not excited, that part is merely extended, it does not grow, but is dilated, begins to ſtretch towards the end of pregnancy, and grows thinner in proportion to its extenſion.

This action of arteries, with an increaſed ſecretion of fluid or a depoſition of ſolid parts, diſtinguiſhes the extenſion of dead matter from the extenſion of living parts, which is always a real growth. When the womb is extended, it is thickened, and never after pregnancy returns to the ſmallneſs of the virgin womb. When after the birth of the child, the breaſts aſſume a new function, they increaſe in ſize, they do not after ſuckling return to their original ſmallneſs, but are the more enlarged the longer the child ſucks them, and in warm climates are lengthened to an enormous degree. When the belly of a pregnant woman is diſtended, it is thickened in its ſubſtance, its cellular ſubſtance is dilated, its arteries are enlarged, its veins become varicoſe; and when the abdominal muſcles, by contracting, expel the child, and empty the abdomen, the ſkin never contracts again, but hangs down in bags, looſe and pendulous. It is the ſame in diſeaſe! for when the delicate membrane of the peritoneum is forced down along with a hernia, its veſſels aſſume a new activity; they are kept in continual action by their unnatural and pendulous poſition; they are excited from time to time by new deſcents of the bowels; and in courſe of time this delicate membrane thickens into a denſe, firm, and very bulky ſac.

The moſt direct dilatation of all, the diſtenſion of an artery in forming an aneuriſm, is not like the extenſion of a tube of elaſtic gum, or other inanimate matter. The diſtenſion of an artery, (as in natural aneuriſms of the femoral artery, or of the aorta), is always accompanied with a remarkable thickening of its coats; it is a real growth; and when, at laſt, a part of the walls of an aneuriſm grow thin and burſt, it is becauſe that part has ſuffered extenſion beyond what the parts can bear; the circulation of a certain portion of the walls of the ſac is hurt by the extenſion, for ſuch extenſion is equal to preſſure, it at laſt prevents the circulation in the vaſa vaſorum, in the arteries which nouriſh the coats of the great artery; the part becomes thin by expanſion and want of nouriſhment, and is little better than dead matter! This is not even an exception to the general rule, it is a confirmation of it. Extenſion, while the veſſels are free and the part nouriſhed, is like a ſtimulus, and promotes growth; but extenſion beyond that point which the veſſels are capable of bearing, operates like the extenſion of dead matter, for while the extenſion goes on, the action of the veſſels becomes gradually weaker, the part extends merely without growing, till at laſt it burſts.

An aneuriſm is to be oppoſed by preſſure; the dilatation of an artery may be oppoſed by tying it; the increaſe of a tumor may be ſtopped by ſuſpending it; a rule which is not peculiar to the ſwellings of the teſticle, but applicable to every pendulous tumour. When a tumour is cut off, its arteries ceaſe to act; and when a limb is amputated, its great arteries being ſtopped, and no blood paſſing laterally, the ſtump ſhrinks, and becomes conical: few ſtumps continue fleſhy and round. In ſtopping an artery with ligature, whether in an aneuriſm or in a ſtump, there is no danger of its dilating, for it is not the force of the heart that urges on the blood, but the action of the arteries which ſolicits it; and when the lower arteries belonging to a great trunk are cut off, the demand ceaſing in that artery, the blood forſakes it, and the artery which is tied up, inſtead of being forced by the heart and dilated, is dried up and ſhrinks; it is obliterated much higher than the point at which it is obſtructed.

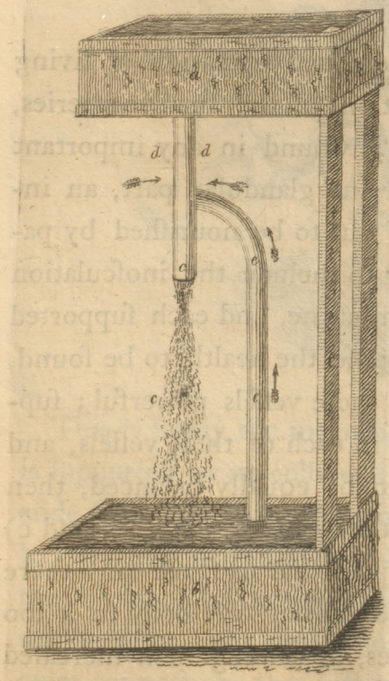
Thus we perceive, that the doctrine of Derivation and Revulſion is a true doctrine, though not preciſely in that ſenſe in which it was acknowledged by the ancients, and is indeed the principle on which many diſeaſes are to be cured. The irritation and counter-irritation of a late celebrated author, is juſt this doctrine of derivation; it is juſt this action and counter-action of veſſels. The effects of fomentations, poultices, onions, warm gums, and adheſive plaſters, in promoting ſlow ſuppurations; the effects of ſetons and iſſues in curing the diſeaſes of joints, by ſubſtituting an increaſed action of the external ſurface to the morbid action of the internal parts; the effects of bliſters upon the ſurface, in relieving inward diſeaſes; the effects of ſuſpenſion and of quiet, in ſtopping the growth of tumors; and the effects of bandages and firm preſſure in healing ulcers, diſcuſſing ſwellings, promoting abſorption; are eaſily explained. Preſſure is ſaid to promote abſorption; but, I believe, it is more uſeful by compreſſing the veſſels, ſuppreſſing their action, and preventing the depoſition of nutritious particles, than by promoting abſorption, or removing thoſe parts which are already organized. How preſſure may prevent the action of arteries, and the depoſition of matter, we can eaſily imagine; but how preſſure can promote the action of abſorbents, or of any other veſſels, it is hard to conceive. If compreſſion be really uſeful in ſuppreſſing the growth of parts, or preventing the afflux of fluids to any diſeaſed part, it ſurely ought to be more univerſally employed.

Perhaps a larger induction of facts might give theſe ſpeculations more importance, and might enable us to obtain a greater command of the action of parts, ſo as to counteract diſeaſe. But my ſole object is to apply the general laws of the

circulating ſyſtem to the condition of an aneuriſmal artery; and I believe I ſhall accompliſh this object moſt eaſily, and aſſure myſelf of the truth of my concluſions, by approximating the laws of the living ſyſtem to ſome of the known laws of fluids moving in rigid and inanimate tubes.

Firſt, It is a well known fact, that a tube never delivers its full quantity of fluid; the force of the current is loſt by friction. A tube always delivers a column of fluid leſs than its own diameter; it delivers leſs in proportion as it is prolonged. A ſimple bore in the ſide of a full veſſel, delivers a ſtream of fluid ſmaller than the diameter of the bore through which it iſſues. A ſtream of fluid iſſuing from a ſimple bore, or through the mouth of a tube, is conſtricted; the ſtream terminates in a ſort of focus, and is ſmaller at a little diſtance, than where it is juſt iſſuing from the mouth of the tube. This reſiſtance at the orifice of a tube, has its effect in a living body, as in varicoſe aneuriſm, where both the opening in the ſide of the artery, and the whole length of the tube above that opening, undergo a proportionate dilatation.

Secondly, The beautiful experiment of Bernoulli proves, that the preſſure upon the ſides of a tube whoſe lower orifice is opened and ſet to run, becomes negative. The ciſterns (a) and (b) being filled with water, while the water is allowed to run from (c), the preſſure of the water becomes negative on the ſides of the tube (d d), inſomuch that the water riſes along the tube (e), from the ciſtern (b). This explains to us why, when a great artery is opened, it diſcharges not merely its own blood, all the blood of the adjoining parts follows it; the blood runs in by all the lateral inoſculations, the blood both before and behind runs towards the open mouth.




This retrograde tide of a fluid which happens even in a ſyſtem of rigid tubes, runs with much greater rapidity in a ſyſtem of living and contractible arteries, which force their fluids on in whatever direction they find a ready vent. This analogy explains the great afflux of blood towards every growing tumour; for when the arteries in which the main trunk terminates act powerfully, the increaſed

action of the extreme arteries and their increaſed demand for blood, is equivalent with the opening of the mouth of a tube! The lateral arteries give up their blood to the main artery and to its active branches; the active veſſels are filled at the expence of the ſurrounding parts; every collateral artery adds its force to that of the main artery, and thoſe branches, which were once ſupplied from the main artery, now pour their blood backwards into it.

This ſhows that they are very ignorant of hydraulics who imagine, that the force of the circulating ſyſtem will bear particularly upon the point where an artery is tied, forcing it ſo as to endanger a dilatation of it. For if that artery have collateral branches, the fluids will move juſt as in this experiment, where the mouth (c) being ſtopped, the preſſure of the fluid on the ſides of the tube will become direct, and the fluid will move downwards along the collateral tube (e), the collaterals, whatever their number, bearing each an equal proportion of the force. Thus it happens, that, when a great artery is tied in anueriſm, its collateral arteries are filled; and the blood of the main artery being diſtributed among them they become turgid, are highly excited, they act very powerfully, and ſupply the place of the trunk, the limb ſwells, and the heat riſes above the natural ſtandard.

But the application of this law of hydraulics to the actual operation of living arteries, require a ſcheme repreſenting the inoſculations of the ſmaller arteries, and the probable courſe of the blood where there is a wound in any important arterial branch. Suppoſe a ſet of veſſels deſtined for any glandular part, an inteſtine, for example; ſuppoſe the walls of a piece of gut to be nouriſhed by parallel arteries of nearly equal ſize; ſuppoſe our view to include the inoſculation of three arteries, each going on to its own piece of inteſtine, and each ſupported by inoſculations from the adjoining branches. Suppoſe the health to be found, the part and all the veſſels entire, and the action of thoſe veſſels powerful; ſuppoſe the movement of the blood to be equally free in each of theſe veſſels, and the individual action of each of the three veſſels to be equally balanced, then the blood will move equally onwards in each of the three veſſels (a b and c) towards its common deſtinations (d e f). But ſuppoſe that in ſpace (m) there is an inflammation or tumor, ſome diſeaſe, either conſiſting originally in a too violent action of the extreme branches of the arteries, or cauſing ſuch increaſed action, then the middle artery (b) is chiefly excited, its branches are diſtended with blood, and its trunk and branches act with ſuch increaſe of power, as to

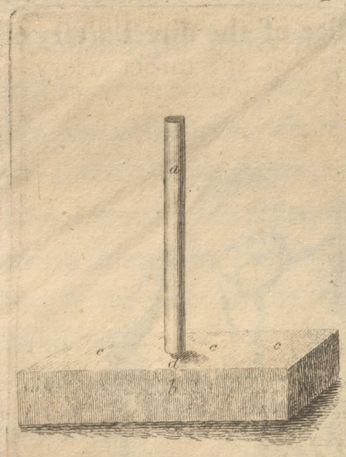
prevail over the collateral arteries (a and c), their branches come to be diſtended and excited; the diſeaſe thus extends to the adjoining parts, and more arteries are drawn into the diſeaſed action.

Suppoſe, on the contrary, that the artery (b) is wounded, that at (g) there is an opening in the canal of the artery which ſpills its blood. The circulation being unſupported at this point, the blood runs out from the artery (b), it runs backwards from all its branches towards the trunk, and the blood of all the adjacent arteries takes the ſame direction. The blood of the branches (a and c) no longer paſſes onwards to its deſtination (d e e f), but runs a retrograde courſe through the inoſculations (h i k); Laſtly, ſuppoſe, after any wound or diſeaſe, the whole trunk (b) obliterated, its collateral branches (a and c) will ſupply its place, and their inoſculating branches perform the office of the direct artery of the part (b).

This is ſurely the meaning of inoſculating arteries; it is thus that each branch is ſupported by its collateral arteries; it is thus that the circulating blood turns aſide from any obſtruction into new channels; it is thus that diſeaſe is propagated by the action of veſſels from branch to branch over large ſurfaces, and alſo through the ſubſtance of the diſeaſed part; and it is thus that the inoſculations, or in other terms the vaſcular connections of a part, limit its diſeaſes. It is from ſuch vaſcular connections that inflammations is tranſmitted from the ſcalp to the ſcull,

from the ſcull to the dura mater, for theſe are the three parts of one ſyſtem of veſſels; it is thus that inflammations are propagated from the pleura to the lungs, the pericardium, and the heart itſelf; it is thus that inflammations and other diſeaſes are limited to the liver, the kidney, the ſpleen, or other organs whoſe veſſels lie within themſelves; and it is thus that inflammations of a general cavity, as the abdomen, affects all the viſcera, and that inflammation or other diſeaſe of the cellular ſubſtance or ſkin, as eryſipelas, for example, has no limits, for the vaſcular connections of the cellular ſubſtance are ſuch that its diſeaſes not only undermine the ſkin, but ſurround the muſcles, and penetrate to the bones.

Another propoſition which I ſhall have occaſion to apply to the general doctrine of aneuriſms is this. The preſſure of fluids is equable in all directions upwards as well as downwards, ſo that a tube (a) being immerſed in a ciſtern, the perpendicular preſſure of the fluid in the direction (a) is proportioned to the height of the column; and that preſſure being communicated to the water in the ciſtern (b), is equal on all parts of the ſurface; and the preſſure on each of the points (c c) of the ciſtern is equal to the preſſure upon the point (d), and the preſſure upon the whole ſurface (c c) is the ſame as of a column of water equal in height to (a), and as broad as the whole ſurface (c c). In conſequence of this law of the equilibrium of fluids, one very remarkable phenomenon preſents itſelf in every great aneuriſm, viz. that the pulſation increaſes in a very ſingular manner indeed; without attending to this law of hydraulics, we cannot imagine how a ſingle artery can communicate ſo powerful an impulſe to a large aneuriſmal ſac. But ſuch pulſation is not proportioned to the artery which enters into the ſac, but to the extent of the ſac itſelf. The ſac expands daily, the pulſation increaſes in proportion to its extent; there is not merely an apparent increaſe of motion, there is a real impulſe, and this force increaſes till it becomes irreſiſtible, drives open the bones of the thorax (if the aneuriſm be confined to that cavity), or, if it be a popliteal aneuriſm confined by the muſcles of the ham, it diſtends the tendons, makes the bones carious by the preſſure, and then burſts.




Another very ſingular circumſtance reſults from comparing this law of hydroſtatics with the various ſpecies of aneuriſm; and it is this, that a very ſmall artery

entering into a large aneuriſmal ſac gives a very powerful pulſation, becauſe the pulſation is always proportioned, not to the ſize of the artery, but to the ſize of the ſac. This is plainly the reaſon why, in that kind of aneuriſm, which I call Aneuriſm by Anaſtomoſis, where many little arteries open into a ſort of cellular ſubſtance, the pulſation feels as heavy as if the tumor were the dilatation of ſome great artery; and this is the reaſon why the retrograde blood of ſmall anaſtomoſing branches, when they enter into an aneuriſmal ſac (as in the caſe where Mr. Pott was ſo alarmed as to cut off the leg), have ſuch ſingular power over the ſac of an aneuriſm which was originally great, which was formed and filled by the femoral artery! for theſe ſmall inoſculating arteries no ſooner fill the bag with blood, than their ſtroke begins to affect the ſac, and they communicate to it as powerful a pulſation, or, at leaſt, as ſenſible a throbbing, as if the great artery actually opened into the ſac.

## CONCLUSION.

Thus have I proved to you, that there are no arteries in any limb entitled to the appropriated name of Inoſculating Arteries; that inoſculation is a form and property of all arteries, eſſential to a free and perfect circulation of the blood: Whereas, ſurgeons have obſerved hitherto no inoſculations, but thoſe which are enlarged in aneuriſm; have known no inoſculating arteries, but thoſe from which they expect the ſafety of a wounded limb: They ſeem to have imagined, that nature has appointed particular inoſculating arteries to nouriſh the limb, when they chooſe to perform their operations in the ham, or at the bend of the arm! never reflecting on the admirable wiſdom with which all parts of the body, even the ſlighteſt and almoſt inviſible inoſculations of arteries, are made to contribute to its preſervation.

Inoſculations aſſiſt the free circulation of the blood, and allow of retrograde motions when required. Inoſculations, by connecting many arteries, enable the blood to leave thoſe veſſels which are obſtructed, or cut off, and ſerve to accumulate the force of many arteries upon that point where the veſſels are particularly required to act. Inoſculations increaſe all the powers of the circulation in

the extreme arteries, and are multiplied in exact proportion as the arteries recede from the heart.

Inoſculation endows the circulating ſyſtem with particular aptitudes and powers; it is eſſential to free circulation, ſecretion, and nouriſhment, to the function of the glands and viſcera, to the regeneration of parts that are deſtroyed, to the ſaving of parts that are injured; and this equable motion of the blood in every direction is eſſential to adheſion.

The power of inoſculation knows no limits, but, like adheſion, is perfect in all parts of the body wherever veſſels exiſt! no part of the body is loſt for want of adheſion; neither can any part be loſt for want of inoſculation. Who could have believed that a bone could adhere to a bone! Who could have believed that the cornea, when cut open in extracting the cataract, or the cryſtalline humour when diſplaced in couching, could adhere to the ſurrounding parts? Who could have believed that the carotids could be ſtopped up! the aorta itſelf interrupted! the vena cava quite obliterated! the thoracic duct oppreſſed, ſo as no longer to tranſmit the lymph, without life being endangered? Who could have believed that the femoral artery, and all its branches on the fore part of the limb, might be obliterated, without the limb falling into gangrene? Surely I am entitled to that broad and univerſal concluſion to which I have laid claim.

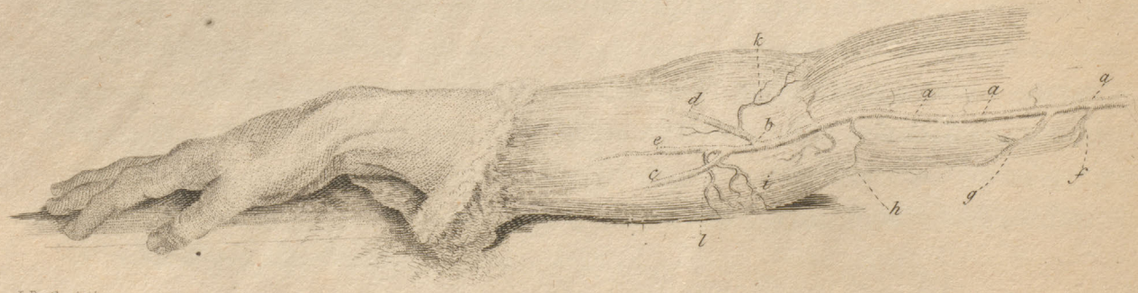
This fear of interrupting the great arteries proceeded merely from ignorance of pathology. Reaſon and experience concur to prove that it is ſafe; and I feel myſelf entitled to lay down, at the concluſion of this diſcourſe, a rule, the very reverſe of that with which it began. After theſe proofs, the queſtions about inoſculations may be blotted out altogether. Wounds of the axillary artery, like wounds of the femoral artery, are often dangerous from ſecondary bleeding, but never fatal from the want of inoſculations. We may tie the greateſt arteries confidently, wherever they are wounded without the trunk of the body. We ſhould tie as boldly the arteries at the groin or in the axilla, as in the leſſer branches going down the thigh or arm. Accidents (as we are in all our operations at the mercy of accident) may undoubtedly prevent our atchieving a cure! A limb bruiſed with a waggon-wheel, or wounded with a great ball, cannot be ſo eaſily ſaved, as when the artery alone is wounded by the ſtab of a knife or ſword. Yet although the accidents and dangers of gangrene were multiplied tenfold! this common way of cutting off the thigh, or amputating the arm at the ſhoulder joint, ſhould be forſaken; it is bad doctrine, and cruel practice.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.




J. Bell. del.

D. Lizars. Scul.

# EXPLANATION OF THE PLANS

OF THE

# CIRCULATING SYSTEM.

To face Page 310.

In this plan of the Circulating Syſtem, I have been chiefly attentive to demonſtrate three great ſets of inoſculations: Firſt, The inoſculations of the thoracic and epigaſtric arteries with each other: Secondly, The inoſculations of the arteries of the ſhoulder and haunch round the ſcapula and pelvis: Thirdly, The inoſculations of the articular arteries round the joints of the elbow and knee.

FIGURE I.

The great artery, the aorta, marked (a), conveys blood to the whole ſyſtem. After departing from the heart, it forms its arch at the root of the neck (b), where it gives off arteries to the head and to the arms; and having deſcended along the back, it forks at (c) in the loins into two great arteries, ſupplying the pelvis and lower extremities.

First, It is obvious that there can be no inoſculation of the aorta with any other great veſſel like itſelf; but the aorta is no ſooner divided into branches for the upper and lower extremities, than thoſe great branches for the limbs inoſculate with each other; for even before the axillary artery departs from the thorax, it gives off the internal mammary artery (1), which turns downwards, and paſſes along the ſternum within the thorax; and the femoral artery, before it emerges from under Paupart's ligament, gives off the epigaſtric artery (2), which turns upwards along the belly, within the fleſh of the rectus muſcle. Theſe arteries inoſculate about the borders of the cheſt (3), and ſuch is the nature of this vaſcular connection, that (being aſſiſted by ſome other ſmall arteries, as the intercoſtals, d d d d) this, the epigaſtric, along with the thoracic arteries, has ſupplied the place even of the aorta itſelf, as I believe I have proved, page 245.

Secondly, The main artery of the arm having advanced to the ſhoulder, divides into two arteries, of nearly equal ſize, the one going along the arm to nouriſh it, while the other, conſiſting of two great branches, named ſcapular arteries (e e), turns round the ſcapula. In like manner, the iliac artery (f f) (the general artery deſtined for the pelvis and lower extremities) divides into two ſets of veſſels; firſt, the arteries named Sciadic, Pudic, and Gluteal, which all proceed from one great artery, deſtined for the pelvis, marked (g g), and turn immediately round the haunch-bone; and, ſecondly, the proper femoral artery (h h), which goes down along the thigh and leg. The ſcapular arteries inoſculate round the ſcapula with the branches of the humeral artery; the arteries of the pelvis inoſculate freely round the haunch bone with the firſt branches of the femoral artery, and ſo freely, that the interruption of the main artery of the leg or arm can never prove fatal merely from want of circulation, though a combination of unfortunate circum-

Plate of the Arterial System  page 318

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To face Page 310.

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The great artery, the aorta, marked (a), conveys blood to the whole ſyſtem. After departing from the heart, it forms its arch at the root of the neck (b), where it gives off arteries to the head and to the arms; and having deſcended along the back, it forks at (c) in the loins into two great arteries, ſupplying the pelvis and lower extremities.

First, It is obvious that there can be no inoſculation of the aorta with any other great veſſel like itſelf; but the aorta is no ſooner divided into branches for the upper and lower extremities, than thoſe great branches for the limbs inoſculate with each other; for even before the axillary artery departs from the thorax, it gives off the internal mammary artery (i), which turns downwards, and paſſes along the ſternum within the thorax; and the femoral artery, before it emerges from under Paupart's ligament, gives off the epigaſtric artery (2), which turns upwards along the belly, within the fleſh of the rectus muſcle. Theſe arteries inoſculate about the borders of the cheſt (3), and ſuch is the nature of this vaſcular connection, that (being aſſiſted by ſome other ſmall arteries, as the intercoſtals, d d d d) this, the epigaſtric, along with the thoracic arteries, has ſupplied the place even of the aorta itſelf, as I believe I have proved, page 245.

Secondly, The main artery of the arm having advanced to the ſhoulder, divides into two arteries, of nearly equal ſize, the one going along the arm to nouriſh it, while the other, conſiſting of two great branches, named ſcapular arteries (e e), turns round the ſcapula. In like manner, the iliac artery (f f) (the general artery deſtined for the pelvis and lower extremities) divides into two ſets of veſſels; firſt, the arteries named Sciadic, Pudic, and Glutæal, which all proceed from one great artery, deſtined for the pelvis, marked (g g), and turn immediately round the haunch-bone; and, ſecondly, the proper femoral artery (h h), which goes down along the thigh and leg. The ſcapular arteries inoſculate round the ſcapula with the branches of the humeral artery; the arteries of the pelvis inoſculate freely round the haunch-bone with the firſt branches of the femoral artery, and ſo freely, that the interruption of the main artery of the leg or arm can never prove fatal merely from want of circulation! though a combination of unfortunate circum-

ſtances ſurely may cauſe gangrene, vid. page 289. Theſe arteries inoſculate ſo freely, that a coarſe injection will paſs through the arteries ſurrounding the joint into the main artery of the limb by the inoſculating branches.

THIRDLY, At the elbow and at the knee-joints, the main artery of the limb ſends off ſmall arteries above the joint, which, from their twiſting round it, are called collateral, or articular, or inoſculating arteries: theſe are met from below by ſmall branches from the arteries of the leg and fore-arm, which, from their turning backwards round the joint, are named recurrent arteries. So ſmall and delicate are theſe arteries, that the main trunk of the limb, being tied either at the bending of the elbow, or at the ham, no injection can be forced round through the inoſculating branches! yet they enlarge ſo eaſily, and do ſo perfectly ſupport the limb when we perform the operation for aneuriſm, that we make no heſitation in performing that operation, which, thirty years ago, was only done in mere deſpair, and with the amputation inſtruments at hand.

A fortiori, the arteries inoſculating round the haunch and ſhoulder, which carry a coarſe injection ſo eaſily, aſſure us of the arm ſurviving, even when the brachial or femoral arteries are tied cloſe to the trunk.

The three ſmaller figures ſhow thoſe ſlender arteries which ſurround the joints. Fig. 2. Shows the popliteal artery, where (a) expreſſes the main artery itſelf; (b) occaſional branches to the gaſtrocnemii muſcles, one of which, the muſcular branches, is always particularly long and large; (c) marks the two ſuperior articular arteries going round the outſide of the knee-joint; (d) marks the ſuperior articular artery going round the inſide of the joint; (e) marks the inferior articular artery going round the inſide of the knee, a large artery; and (f) marks the lower external articular, or circumflex, bending round the outſide of the joint.

Fig. 3. Shows the fore-part of the knee-joint, and the articular arteries are ſeen turning round the fore-part of the knee; (g) marks the two ſuperior articular arteries on the outſide of the knee-joint; (h) marks two long branches, alſo twiſting round the inſide; and (i) marks a very large, and conſtant recurrent artery, which turns upwards from the anterior fibular artery; this branch is ſeen here, at (k), juſt making its exit from betwixt the bones.

Fig. 4. Shows the arm thrown out along the diſſecting board: The main artery, the humeral artery, is marked (a a); the diviſion into the radial, ulnar, and interoſſeous arteries, is marked (b); the ulnar (c), the radial (d), the interoſſeous (e); the profunda humeri ſuperior is marked (f), the profunda humeri inferior, is marked (g), and the ramus anaſtomoticus major is marked (h); the ulnar recurrent is marked (i), the radial recurrent is marked (k), and the interoſſeous recurrent is marked (l). The inoſculations of the recurrent and anaſtomoſing arteries are too delicate to be ſeen, even in an injected arm, unleſs the arteries be very well filled.

# DISCOURSE VII.

## THE HISTORY AND CAUSES OF ANEURISMS.

"WOULD you know," ſays the celebrated Guattani, "how I was inſpired with love for my profeſſion and enthuſiaſm in ſtudy! I will relate the manner of it very willingly, for, in truth, certain accidents which ſtruck my imagination early in life were the cauſe. † Firſt, A bailiff who had been ſhot with a piſtol in the bend of the arm, was laid in the hoſpital of the Holy Ghoſt, where, for ſeven days, his cure proceeded with every favourable ſign; but would you believe it! on the morning of the eighth day when I went to viſit this man, the attendants met me and told me he was dead? This unaccountable and ſudden death induced me to diſſect the body, I found the ſide of the artery open, and the eſchar which the ball had produced partly adhering, partly ſeparated, no bigger than a grain of corn; it was by the ſudden yielding of this eſchar that he loſt his life! Almoſt on the ſame day, another whoſe artery had been pricked in bleeding, died of the hæmorrhagy without even an attempt to ſave his life! Another whoſe aneuriſm was in the ham, had a cauſtic applied to it, and when the eſchar fell off he bled to death! Another ſtill had his aneuriſm opened with an actual cautery and immediately expired from loſs of blood! To theſe diſmal ſcenes which I myſelf have witneſſed, what numbers might I not add from the conſultations and writings of others?"

If you, Gentlemen, have not yet witneſſed the uncertainty that prevails in conſultations about aneuriſms of the great arteries; the hurry, confuſion, and diſmay, ſo legible in every countenance while the bloody operation is performing; if you have not, when the unhappy patient has been left to his fate, obſerved the pulſation increaſing from day to day, nor felt the awful throbbing, nor ſeen the blood

† This is not a literal tranſlation of the text of Guattani, theſe accidents awakened in him, not this general love of ſtudy, but a particular deſire to ſtudy aneuriſm. "Quod ſi ſcire aves, inde in me originem duxerit prurigo in univerſa chirurgia quæ tam longe lateque diffunditur, hanc unam excipiendi græmio, ferioque excolendi materiam."

welling out through the cracked, livid, and gangrenous ſkin, preludes to that laſt torrent by which the man is to expire! if you have not yet ſeen the affecting ſituation of ſuch a patient beyond the reach of help reſigning himſelf to his fate, you cannot feel all the importance of this ſubject.

I will boldly neglect thoſe inſignificant definitions which never can circumſcribe a ſubject like this, definitions ſuch as no ſenſible ſtudent will value, nor any wiſe teacher attempt; and proceed to give you a full and plain hiſtory of aneuriſms! For deciſion and judgment in operating or in conſulting, depend not on curious and nice diſtinctions, but on univerſal knowledge. I will endeavour therefore to diſcloſe to you the true principles of pathology, to lay before you all the materials for further ſtudy, to teach you habits of reflecting and deliberating upon the nature of this diſeaſe.

## DESCRIPTIONS OF ANEURISMS.

Aneuriſm, when it ariſes without blow or hurt, ſteals on ſlowly. A ſmall tumor is felt for inſtance in the ham, it is ſmall at firſt and firm, and but little affected by the pulſation of the artery. It lies deep among the fleſh, and muſt be felt for by working in the fingers and preſſing aſide the adjacent parts. It is ſuppoſed to be a knot or kernel, has little pain, is neglected for many weeks, and might be miſtaken even by a ſurgeon for a ſwelled gland. This little tumor grows, and beats more ſtrongly, but an ignorant and hard working man is not eaſily alarmed, nor willing to forſake the daily labours by which he provides for his family. Still the tumor beats ſtrongly, and the patient is at times alarmed; there is an unaccountable heavineſs, pain, and numbneſs through all the limb, and by thoſe ſhooting pains and this heavy lameneſs, he is obliged to aſk advice. The ſurgeon with marks ſo deciſive as theſe, knows this throbbing tumor to be an aneuriſm; he offers the man his aſſiſtance, begs him to ſubmit to regimen, low diet, confinement, and a gentle bandage; he adviſes him to go to an hoſpital, but the patient is unwilling to think thus ſeriouſly of his diſeaſe.

From week to week this poor man works and reſts alternately, is careleſs of the limb, ſtill hoping that it is but a ſlight complaint, till at laſt by pain, lameneſs, he is confined to bed; and by the intenſe throbbing he is truly alarmed. The

ſurgeon, now called again, is alſo ſeriouſly alarmed, he finds the tumor throbbing ſtrongly, increaſing rapidly, beginning to fill up the cavity of the ham, yet too painful, and too much inflamed to ſuffer compreſſion; but while he is heſitating what to do, or whether an operation may be propoſed, it often happens that a ſecond aneuriſm begins to form in the other ham.

In a few weeks this ham alſo is diſtended with a hard, firm, and throbbing tumor, hard as a ſtone, and riſing ſtrongly with each pulſe of the artery. The leg becomes œdematous, the thigh ſwells, the whole limb becomes heavy, cold, and pulſeleſs; perhaps the pulſation in the tumor ceaſes, but the parts ſtill continue thick, the tumor firm, but not yet threatening to burſt. After ſome weeks of ſuffering, another tumor appears in the oppoſite thigh, and as if from the greater power of the femoral artery, or from the whole arterial ſyſtem being prediſpoſed to diſeaſe, this third aneuriſm increaſes with a rapidity wholly alarming. Which of theſe great aneuriſms ſhall burſt and be the cauſe of death, ſeems long doubtful, till, as if the greater aneuriſm of the thigh had drawn off the blood to itſelf, the progreſs of the original tumor is no longer obſerved, the aneuriſm of the thigh increaſes from day to day, and the patient now weakened by many months confinement, is quite exhauſted with pain and fever, and conſtant ſuffering. If he ſurvive, the greater tumor becomes livid, the ſkin becomes thinner from day to day, but not ſofter, it is parched and hard as if from want of nouriſhment, it cracks and ſcabs, and then blood iſſues through the crevices. For ten days he is ſenſible of approaching death, and aſks for opiates that he may die quietly; at laſt the blood burſts out, he immediately faints, but is ſaved from this firſt hæmorrhagy; he falls low, is ſeized with ſickneſs and vomiting, a low delirium comes on, and the next morning, after a ſlight diſcharge of blood, he expires.

How can we doubt that this is truly a ſpontaneous aneuriſm proceeding from a diſeaſe of the whole arterial ſyſtem which needs no exciting cauſe, when tumor riſes after tumor, in the ham, in the thigh, in the groin, without any obvious injury? Such tumors begin during ſickneſs and convaleſcence, while the patient is in a ſtate of perfect quiet, and while there is not even the ſlighteſt fever to account for this dilatation of the artery; but if doubts concerning its nature remain, we generally find them all reſolved by the diſſection of the body. Theſe ſucceſſive aneuriſms are found to be true dilatations of the artery, there is no breach of the arterial coats, the cellular, the muſcular, the villous coats are thickened as they approach the dilated part, and may be fairly traced over the aneuriſ-

mal tumor, it is on the tumor indeed that the ſeveral coats are moſt diſtinctly traced. But ſtrong as this prediſpoſition is, we are aſtoniſhed to find theſe dilatations end gradually and gently in the ſound artery, which has in the intermediate parts not the ſlighteſt mark of diſeaſe, the arterial ſyſtem being throughout limber, ſoft, and natural.

But aneuriſm often ariſes not only from this inſcrutible prediſpoſition, but from an actual and manifeſt diſeaſe of the arterial ſyſtem. This diſeaſe is repreſented in the drawing which I have formerly given of a rigid oſſifying and dilated artery. We find throughout the arterial ſyſtem, the coats of the arteries thickened and brittle, their cellular ſubſtance looſe and ſpongy, with ſpots and ſpecks of oſſification beſetting the great arterial trunks. We find the great arteries dilated where they give off their larger branches, and the arch of the aorta or beginning of the ſubclavian arteries in an aneuriſmal ſtate, while the lower part of the aorta is ſmall, crooked, and irregular. Theſe are the marks of a diſeaſe which prevails towards the decline of life; it is often obſerved before the fortieth year; but it is ſingular, that till the approach of that period of life, natural aneuriſms are extremely rare: Aneuriſms are rare in women, or rather they are never heard of in that ſex; they are frequent in ſtrong and hard working men, but in them alſo they rarely occur till after the thirtieth year, when their arteries begin to acquire this hard and rigid condition. At that period of life, in laborious and hard working men, the joints are not ſtiff nor their muſcles ſhrunk, they feel ſtrong and healthy, they are in the habits of ſtrong occaſional exertions and continual labour, they are accuſtomed alſo to violent actions of the limbs, ſuch as their arteries are but ill able to bear. In ſhort, the defects of old age have come upon the arteries ſooner than upon the reſt of the ſyſtem, the arteries are unequal to thoſe exertions of which the muſcular frame is ſtill capable, one part of the ſyſtem is weakened before another, which is the very eſſence of diſeaſe, or prediſpoſition to diſeaſe.

Yet this prediſpoſition is of ſuch a nature, that it ſeldom degenerates into aneuriſm without ſome direct violence. In all parts of the body there are weakneſſes and imperfections which we are made ſenſible of only by the part being hurt. Aneuriſms of the limbs are never known in women, their ſyſtem is lax, and what is more favourable, they are exempted from thoſe exertions by which the arteries are often injured or burſt. Aneuriſm is rare in young men, and frequent in the middle ſtage of life when the arteries become harder, when the muſcular ſtrength is unabated, and the occaſional exertions of the limbs very violent. Aneuriſm is almoſt

peculiar to men in the lower ranks of life, to ſoldiers, porters, labourers, miners, and thoſe who work at laborious trades; it is particularly frequent in poſtillions, troopers, and the drivers of ſtage coaches, and though the tumor has at firſt all the ſigns and appearances of natural aneuriſm, yet there are few of thoſe enlargements of the artery which cannot be diſtinctly traced to ſome external injury, ſome blow, ſprain, fall, or violent exertion of the limb! There are few, indeed, that do not immediately and perceptibly follow the injury. Often, I am perſuaded, the artery is not merely injured, but abſolutely burſt or broken acroſs! Aneuriſm of the ham is more frequent, in conſequence of the artery at that part lying cloſe under the knee joint, bending over the condyles, and bound down by the heads of the gaſtrocnemii muſcles, whence it is endangered by every ſudden motion of the joint, and affected by every ſtrain of the limb. Aneuriſm is frequent alſo in the thigh, in conſequence of the length and great ſize of the femoral artery, its oblique courſe round the thigh, its paſſing through the tendon of the triceps, and from the manner alſo in which it is braced down by the muſcles. The operation of theſe various cauſes of laceration muſt next be explained.

An artery ſuch as I have juſt deſcribed it, rigid and diſeaſed, an artery which tears under the ſurgeon's ligature, which burſts upon injection, which, in diſſections, feels ſo palpably hard and brittle, is not ſurely calculated to reſiſt violent ſtrains or ſudden motions of the joint; and accordingly we ſometimes find an artery perceptibly lacerated by external violence and ſudden bending of the joint, juſt as it might be broken acroſs with the finger and thumb in diſſection.

"Three years ago," ſays Walther, "I had the long wiſhed-for opportunity of diſſecting an aneuriſmal limb. An old man about fifty years of age, of a conſtitution naturally hale and vigorous, was confined to his bed, crooked with rheumatiſm, and tortured with pains in his knees; his left knee eſpecially gave him great diſtreſs, "Chiragra fregerit articulos veteris ramalia fagi." This miſerable creature being wretchedly poor, inſtead of ſending for better aſſiſtance, applied to an old woman, who, having firſt extended his crooked knee very violently, wrapped it up in ſome of her plaſters *. This extenſion of his knee was extremely painful to him, and he ſoon perceived a ſmall tumor upon the popliteal artery, it pul-

* "Observatio.—Tertius volvitur annus cum jam dudum exoptata mihi daretur occaſio, aneuriſma arteriæ popliteæ examini anatomico ſubjicere. Vir quinquaginta circiter annos natus corporis robuſti et ſani, doloribus rheumaticis circa genua excruciatus, in lecto per aliquot ſeptimanas retentus fuit, ſummum vero dolorem in genu ſiniſtro ſenſit. Miſer, qui in ſumma paupertate vixit, aniculam in auxilium vocabat, hæc

ſated very ſtrongly, and upon the ſlighteſt preſſure produced exquiſite pain. This aneuriſm gradually increaſed to an enormous ſize, and it was only when the poor man became ſenſible of having no other chance for life, that he ſubmitted to amputation."

" The limb was immediately carried to Walther's rooms, where, upon diſſection, it was found, that the popliteal artery was dilated into an aneuriſmal bag of a heart-like ſhape, of three inches broad and four inches long, occupying the main artery from a little below where it gives off its two upper articular arteries, to within an inch of that point where it divides into the tibial and fibular arteries. The heads of the gaſtrocnemii ſolæi and plantar muſcles, where they covered the ſac, were extended to a remarkable degree of thickneſs, and the great vein and nerve raiſed by the tumor, were protruded betwixt the two heads of the gaſtrocnemii muſcles, ſo as to be in cloſe contact with the ſkin."

In the drawing of this aneuriſm by Walther, which is indeed very beautiful, we ſee oſſeous concretions occupying the coats of the tibial and fibular arteries below the aneuriſm. We have every reaſon to preſume, that in the ham, and in the upper parts of the femoral arteries, theſe ſpecks of oſſification muſt have been much broader and more frequent. Theſe oſſifications are the ſureſt marks of this brittle unyielding ſtate of a great artery. The " veteris ramalia fagi," the crooked and knotty branches of an exhauſted tree, may ſerve as an apt emblem of this artery, rigid, unyielding, and brittle, and we have no reaſon to wonder at the effects of the quackiſh old woman's extending the contracted joint thus ſuddenly. An artery muſt, like the ligaments and other parts; where the joint continues for any length of time thus crooked and ſtiff, be proportionably ſhortened, and an artery in this brittle ſtate muſt be unfit to bear ſudden extenſion. In this inſtance, ſome of theſe brittle oſſifications had given way or hurt the adjoining parts, the remaining coats of the artery had dilated into a true aneuriſm, the artery certainly had been injured, though not entirely lacerated, for the drawing repreſents a true aneuriſm, a ſac entire and continuous with the arterial coats.

But the aneuriſm often ſo immediately ſucceeds the blow or fall! the tumor,

ſtatim genu ſiniſtrum unguentis et emplaſtris tegebat, præprimis vero violento modo, genu propter dolores flexum, extendit. Facta extenſione æger adhuc graviores perſenſit dolores, imprimis vero brevi temporis ſpatio elapſo, animadvertit tuberculum in arteria poplitea, quod valde pulſabat atque vel leniter compreſſum ægro dolores concitabat. Increvit tandem aneuriſma ad ſtupendam magnitudinem, et cum infelici non alia vitæ ſpes ſupereſſet, quam chirurgica operatio, amputatio dicta, ille ſe huic ſubjecit."—" Die ſubſequente peracta operatione, femur cum crure præciſum, calidum adhuc, mihi oblatum fuit."

the pain, the lameneſs ſo inſtantaneouſly follow the injury done to the artery, that we can have no doubt of its being abſolutely lacerated ſo as to produce a falſe aneuriſm, I mean an immediate extravaſation of blood, and not a mere dilatation of the arterial tube.

John Robertſon, a carpenter, a young man in full health, who had never felt the ſlighteſt uneaſineſs in his thigh, in whom there was no reaſon to ſuſpect any previous diſeaſe, got very drunk and fell ſeveral times in the ſtreets. Before the third day, he began to perceive a ſwelling in the middle of his thigh, which had a ſtrong pulſation, and was very painful, and by the eleventh day both the ſwelling and pain had increaſed conſiderably. He was then conveyed to St. George's Hoſpital, and on the twelfth day the ſurgeons held a conſultation on his caſe. "They were of opinion, in one voice, that this was a *FALSE ANEURISM* occaſioned by the rupture of *SOME* large artery; that the aneuriſmal ſac ought to be opened, and, if the ruptured veſſel was found to be only a collateral branch, that it ought to be tied, but if it proved to be the trunk of the crural artery which was ruptured, that the amputating the limb was the only method to be uſed! to ſave the patient's life." The ſac being opened, it was found to be actually the crural artery which had burſt, the limb was amputated accordingly and the man ſurvived *."

In the natural aneuriſms which I have hitherto deſcribed, we ſee the ſlow dilatation of an artery. The tumor is at firſt without pain, ſmall, firm, and to be felt only by working the fingers deep among the fleſh of the thigh. At firſt it is not to be diſtinguiſhed even by the ſurgeon from a ſmall lymphatic tumor receiving the pulſation of ſome contiguous artery, and ſuch tumor increaſes for months before it aſſumes the pulſation, pain, and other characteriſtics of an aneuriſm. But when, as it often happens, a man in the very time of falling, as in the inſtance of a blow, or ſprain, feels pain in the ham †, when he obſerves that he has from that moment conſiderable pain in laying his leg acroſs; when, on the third or fourth day he feels diſtinctly the pulſation, pain, and lameneſs, which are the peculiar ſigns of aneuriſm, what reaſon can there be for doubting that the artery is burſt? None, ſurely, but the ſlowneſs with which the aneuriſm grows. The ſlow manner, then, in which even the greater arteries of the body form their aneuriſm muſt next be explained.

We are naturally inclined to believe that an artery thus broken or lacerated, muſt form its aneuriſm the moment its coats give way, and muſt be able to over-

* Phyſical Eſſays and Obſervations of Edinburgh, Vol. III. page 217, 218.

† This man felt no pain in the moment, becauſe he was drunk.

come all reſiſtance from the ſurrounding parts in a few days! But here we are deceived; we muſt not regard the artery as a naked and inſulated tube, ſuch as is repreſented in Figure 1ſt, merely laid along the limb, unconnected with the ſurrounding parts, unſupported by cellular ſubſtance. The artery has a cellular coat in which it is lodged; this coat is ſo peculiar as to be called the ſheath or capſule of the artery, and is cloſely connected with the proper coats of the artery by cellular ſubſtance and numerous veſſels, which ſtrengthen, ſupport, and nouriſh it; and when the proper coats of an artery are torn, the blood is not widely extravaſated, but is confined by this ſheath of cellular membrane which is very ſlowly forced, or ſeparated from the artery. Even after the ſheath is ſeparated from the artery it does not entirely give way, but its cellular ſubſtance is kneaded as it were with the half coagulated blood, and riſes into a tumor ſomewhat reſembling the thrombus which riſes over an ill cloſed vein.

Fig. 2d repreſents the true and natural condition of the artery which is every where nouriſhed by its cellular ſheath, and (a) repreſents a laceration or rupture of the artery, ſhowing how the ſheath and cellular ſubſtance (a a) is oppoſed at (b) to the exit of the blood.

Fig. 3d repreſents the aneuriſm already beginning to form. Here is once more repreſented, the continued ſheath (a a), within which the great artery is encloſed; large branches (b b), ſuch as the profunda femoris, and ſmaller muſcular twigs, (c c) are marked going off from the great trunk, each having its own peculiar ſheath. For the ſmalleſt arteries are as well ſupported with cellular ſubſtance, and have ſheaths as peculiar as the femoral or carotid arteries; each little artery, as it penetrates among the muſcles, is encloſed along with its correſponding vein, and often with a ſmall twig of a nerve, in a peculiar faſcia. Aneuriſm produced by the burſting or laceration of an artery dilates ſlowly, becauſe, the continued canal of the artery (d) is ſtill open to the blood, the cellular ſubſtance yields very ſlowly, the blood coagulating in hard and firm clots at (e e) walls up the artery, and is ſo mixed with the firſt lamellæ of the cellular ſubſtance, and is ſo firmly clotted as to make a ſtrong reſiſtance. At firſt, while the blood is confined to its natural courſe, the progreſs of aneuriſm is ſlow. But when the cavity of the aneuriſm (e e) is enlarged, when the blood begins to collect there, and the circulation becomes irregular, theſe clots give way from time to time, and by exerciſe, working, or accidental excitements, there is from time to time a new impetus againſt the ſides of the ſac itſelf, and it enlarges; the clots which line the cellular ſubſtance become bigger and firmer; layer is added to layer, and at every

addition of this kind, the fluid contents of the aneuriſm accumulate, the open part of the bag enlarges, and the cellular ſheath (f) of the artery, which in fact correſponds with the point (b) in Fig. 2d, is condenſed into a firm aneuriſmal ſac, which gives the whole tumor ſometimes the appearance of a ſpontaneous and natural dilatation of the artery itſelf. Thus there is formed a great tumor of clotted blood, ſurrounded with a firm cellular ſac, and bounding a cavity which is continuous with the artery, where the circulation of the blood is irregular, and often accompanied with a whizzing noiſe.

This hard and firm tumor, riſing higher and higher over the artery, begins at laſt to compreſs the canal of the artery itſelf; the clots ſometimes looſen, fall down, and almoſt choke the current of the blood; the limb grows cold and benumbed, from the compreſſion of the great trunk, and it ſwells and inflames from the enlargement of the inoſculating arteries. By the perpetual and increaſing pulſation, the preſſure and ſtraitneſs increaſe, the bones are ſpoiled within, and the integuments are almoſt deſtroyed without; the limb is ſafe, for the inoſculating arteries are enlarged, yet, when the tumor burſts, the patient dies from the burſting of the main artery, and the immediate loſs of blood.

Thus we perceive that the increaſe of ſuch an aneuriſm, where the artery is abſolutely broken acroſs, is naturally ſlow; that the reſiſtance is uniformly great;

that the artery does not lie as in our preparation glaſſes, or on the diſſecting table, inſulated and unconnected, but is ſurrounded with cellular ſubſtance; its rupture is walled up with coagulated blood; its canal is open to the circulating fluids, and there is, for a long while, a firm pulſe even in the artery which is deſperately wounded, provided it be not entirely cut acroſs *.

* EXPLANATION OF THE ETCHED PLATE.

Aneuriſm proceeding thus, from violence done to the artery, is very eaſily diſtinguiſhed from that which proceeds from a natural dilatation of the tube. I have given this ſheet of Etchings to explain this piece of Pathology.

In Figure 1ſt is ſeen a Femoral Artery where the dilatations are plainly of that kind which is called Natural Aneuriſm, the dilatation being ſpontaneous and gradual; and in this ſketch it will be noticed, that ſince the profunda (a) comes off from one of the aneuriſmal ſacs, had that ſac increaſed ſo as to become a formidable aneuriſm, had the operation been performed, and the ligature been tied above that aneuriſm, the inoſculating arteries communicating with the profunda would have poured their blood into the ſac, and cauſed a ſecondary hæmorrhagy if the ſac was cut open, or ſet it a pulſating again, if it was left untouched.

In Figure 2d you have a ſketch of that Aneuriſm which I have been juſt deſcribing, where the old woman, by her violent bending of the knee, injured the artery, and, I have very little doubt, broke it acroſs, and left the breach in the artery ſuſtained only by its external coat of common cellular ſubſtance.

In Figure 3d you have another ſketch of an Aneuriſm, which was operated upon by Mr. Hunter. The man died ſome years after, the artery was diſſected out, and the following circumſtances deſerve particular notice: 1ſt, The artery (b b) was oſſified throughout the whole length of the thigh; this does not ſeem to have been the conſequence of the operation merely, for the profunda, which was not touched by the ligature, was alſo oſſified: therefore this man's ſyſtem of arteries was prediſpoſed to this rupture of the arterial coats, and his trade, viz. that of a hackney-coachman, expoſed him to blows, twiſts, and ſtrains. 2dly, The aneuriſmal ſac (c) lay altogether upon the back of the artery; it was formed all on one ſide, as if the artery had given way on one ſide; it lay ſo over the artery as to preſs ſtrongly upon it. "The aneuriſm had, in ſome meaſure, the appearance of a ſeparate bag, it was oblong, a little flattened, and like a hen's egg, and contained a ſolid coagulum." 3dly, It is indeed very intereſting to obſerve the inoſculations, for we find every mark of great activity among the ſmaller arteries of the thigh, to ſupply the want of the trunk. The femoral artery is indeed obliterated in the thigh at (b b), but for ſome ſpace above the aneuriſm as at (d), the canal is again open, and receives many inoſculating arteries (e e e), and is full of blood. The popliteal artery, under the aneuriſmal bag, is ſo obliterated that the lower mouth of the artery cannot be found. At (f f) the popliteal artery becomes once more pervious, it there alſo receives many inoſculations, by thoſe inoſculations the blood probably came down both from the profunda, along the back of the thigh, and alſo by ſhorter inoſculations, joining the pervious part of the artery above the aneuriſm, to the continuation of the artery below the tumor; e e e marks the inoſculating arteries, d marks the pervious part of the artery below the tumor, and f the diviſion of the popliteal artery into the tibial and fibular arteries; g marks a large and curling inoſculating artery, which manifeſtly has borne much of the force of the circulation, is greatly enlarged, and ſeems to have taken precedency of all the other inoſculations; h h h marks the great crural vein, with its branches accompanying the artery.

# Drawings of Natural Aneurisms.

Explained page 320.

Fig. 3.

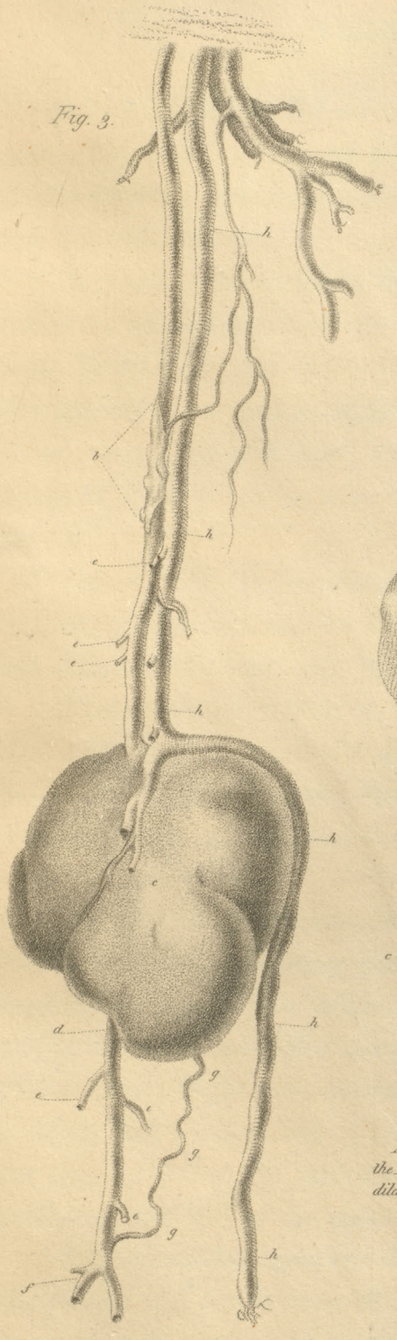


Fig. 3.

*A Popliteal Aneurism which had been operated on by Mr. Hunter, where the ossification which had predisposed the Artery to dilatation is seen at b. The small inosculating Arteries receiving Blood from above are marked c c, and one large inosculating branch transmitting the Blood to the Artery below is marked g.*

Fig. 2.

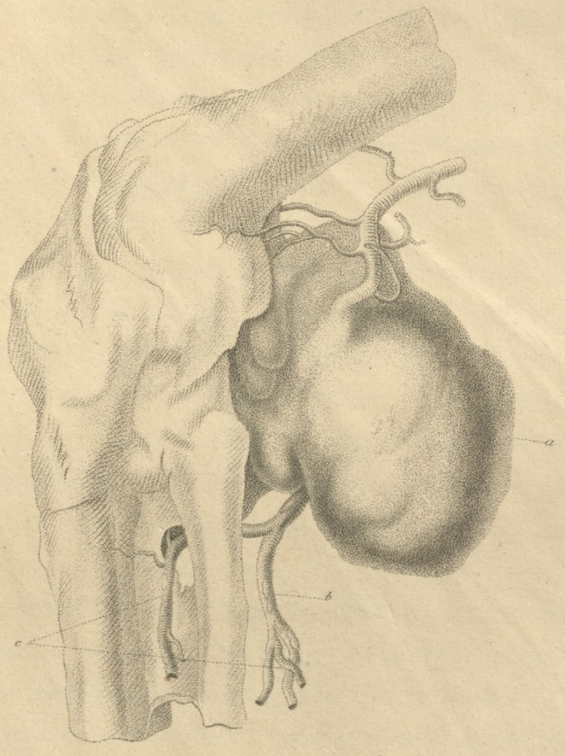


Fig. 2

*An Aneurism of the ham from Walther: a represents the Aneurismal Sac, b small Ossifications just below the dilated part, c the Tibial Arteries.*

Fig. 1.

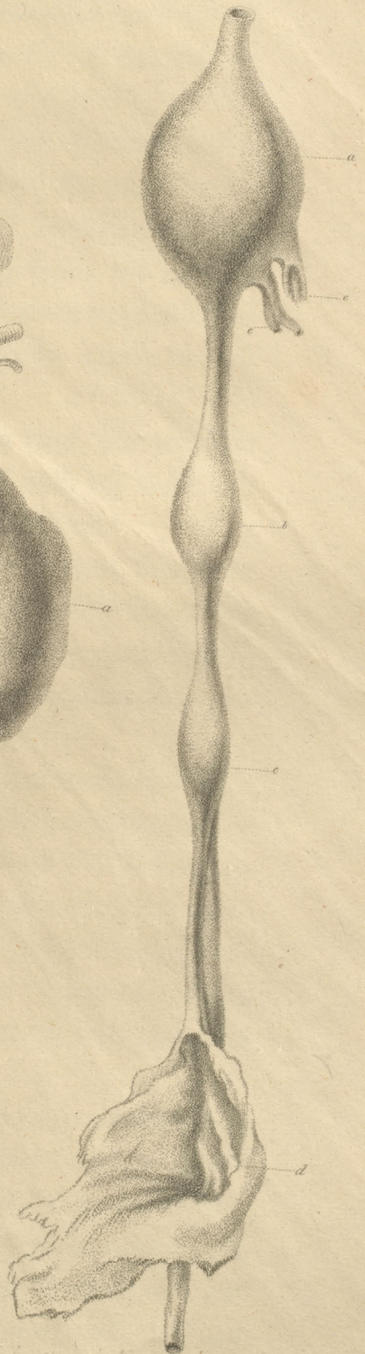


Fig. 1.

*A diseased state of the Femoral Artery, where a b c represent a succession of Aneurismal Sacs. d one of those Sacs opened, and e the Profunda and its branches going off from the uppermost Aneurismal Sac.*

J. Bell del.

Archibald sculp.

While I relate the following caſe to you, you will expect, from paragraph to paragraph, a deſcription of a dilated artery, an aneuriſmal ſac, and a burſting of the aneuriſm; but the diſeaſe proceeded merely from a laceration of the artery, and the circumſtances of it are of the moſt intereſting nature.

" A young man of about thirty-ſeven years of age, of a lax and delicate conſtitution, a tin-worker, had uſed this trade from his childhood, had frequent occaſion, in beating and melting the tin, to remain long at the furnaces, or under ground; was much addicted to venery; had been poxed from his earlieſt years; was a keen hunter, and was wont to go out with the nets, regardleſs of hours or ſeaſons. This man had for many years pains, which he choſe to call goutty."

" On the firſt of November 1742, while ſtraining under a load, his left foot ſlipped; he made a ſudden effort, and tried to ſupport himſelf with his right leg, but inſtantly felt ſuch pain in his thigh, that he fell down and fainted."

" Proper remedies were applied, and though he never after walked firmly on that leg, yet he paſſed the ſpring and ſucceeding ſummer tolerably free from pain. But in the following November the diſeaſe returned, pungent pains ſhot along the thigh and leg, and thoſe which paſſed from the ham to the foot were peculiarly ſevere."

" An apothecary who was called in, preſcribed the uſual fomentations and ointments for this excruciating pain; but when he began to obſerve a firm tumor above the middle of the thigh, and of conſiderable ſize, he deſired that a ſurgeon might be conſulted: But the patient conſulted a prieſt, who, eſteeming the complaint a very ſlight one, promiſed to cure him. The diſeaſe (ſays Guattani) increaſed, and I was called to viſit him on the 12th of November. Upon examining the thigh, I found the tumor or hardneſs prominent, circumſcribed, irregular, and pulſating, but ſtill of the natural colour of the ſkin."

" I could not be ignorant that this was an aneuriſm; I ſtraightway explained the nature and importance of this diſeaſe, adviſed that ſome other ſurgeons ſhould be conſulted, preſcribed a regimen, and applied ſimple ointment to the tumor. The celebrated Joannes Victorius Maſini, my ancient and reſpected maſter was called, who, agreeing with me entirely, ordered the bowels to be emptyed, and ſome blood to be taken from the arm; his directions were immediately fulfilled, the whole thigh being at the ſame time anointed with ointment of roſes and althea."

You will notice now the commencement of one of the moſt extraordinary appearances in aneuriſm that has ever been related; for at this period the aneuriſm burſt out among the cellular ſubſtance; and, by ſucceſſive impulſes, burſt again and again, with a ſenſe of laceration from time to time, during the night.

" On the 15th of November, about three in the morning, the pain became exceedingly violent, and before four, the whole thigh was ſwelled, with ſuch increaſe of pulſation and pain, that the man was in torture. At four in the morning, he felt ſuddenly as if ſomething had burſt in the moſt prominent part of the thigh; it ſeemed to him like the ſplitting and tearing of new cloth; along with this ſenſation came on excruciating pain, which raged for a full hour. At nine he felt, in the ſame ſpot, a ſecond yielding and ſenſe of laceration, ſlighter than the firſt, accompanied with a ſlight degree of pain, which ſoon ſubſided, and at the diſtance of four hours more, he felt the ſame ſenſation a third time, but ſlighter than either of the former."

" In the morning (ſays Guattani) I was informed of theſe circumſtances; I found the thigh ſwelled to twice its natural thickneſs, with a painful diſtenſion of the limb, and ſuch hardneſs as entirely prevented the pulſation."

" On the 19th of November, ſoon after my morning viſit, he fell into ſuch excruciating agonies, that his attendants thought him expiring; but in an hour after his pain was remarkably abated. Towards evening I could perceive that the upper tumor had extended four inches upwards, towards the origin of the Sartorius Rectus and Vaſtus Internus muſcles, with tenſion and diſtinct pulſation, and I apprehended that, beſides blood, it contained no ſmall quantity of air."

" The next day he was indeed ſomewhat relieved of the pain, but was extremely weak, wherefore I ordered them to adminiſter extreme unction, applied a maſh of leeks and vinegar to the tumor, but, though this application had its effect, the pains, after ſome hours increaſed; the patient, of his own accord, had recourſe again to the ſoftening ointments, but without effect; he continued during the night pained and delirious, and frequently imagined that he felt ſomething riſing from his thigh to his heart."

" The next morning, tho' his pain was leſs, his pulſe was ſunk, his face was death-like; and, after ſome tremulous motions of the limb, and ſlight convulſions of the whole body, he expired."

" On opening the abdomen, I found the ilium conſiderably inflamed; I then diſſected the artery backwards, along the haunch bone, to the ligament of the

thigh, and cleared it of the gangrenous peritoneum, with which it was covered; and then laying open the femoral ligament and the teguments of the groin, I continued to diſſect along the courſe of the artery, clearing it of the ſurrounding parts, till I arrived at the tumor, which was but a very little below the groin. After diſſecting the tumor carefully, I found it to conſiſt of grumous blood, to the amount of three pounds and a half. This extravaſation lay in the interſtice of the muſcles, in the bed of the great veſſels. It ſeparated the ſartorius and triceps from the Rectus Cruris, and extended along the whole thigh from the groin to the knee. This blood being cleared away, the artery appeared lacerated nearly to the extent of two inches."

" This diſſection fully accounts for the patient's death; but how an artery, not ſubject to great extenſion, and thus ſafely and ſoftly lodged, ſhould be ſo eaſily broken, we cannot ſo readily underſtand. To reſolve this difficulty, I continued my diſſection along the artery; I found it perfectly ſound for two inches, and then it expanded into a ſecond tumor, of the ſize of an egg; and, upon opening this aneuriſm, I found the blood ſo fairly coagulated in it, as entirely to prevent the paſſage of the blood through it." This blood being now cleared away, it appeared, that in this aneuriſm the coats of the artery were eroded in two places; in the one place, all the coats were eroded except the external; in the other, the eroſion did not go ſo deep; betwixt theſe two places, there ſtood up, a ſeptum, or partition, which ſerved as a ſort of valve. The internal coat of the artery, where it approached the aneuriſmal parts, and alſo the internal membrane of the aneuriſmal ſac, was ſeparated into various laminæ, as if it had been touched with ſome corrugating liquor, which gave me an excellent opportunity of obſerving the fleſhy fibres of the muſcular coat, ſo rarely ſeen."

" Thus it appears, that the obſtruction in the lower aneuriſmal ſac cauſed the burſting of the upper one; and the occaſional eaſe or difficulty with which the blood paſſed along the lateral branches to the muſcles, may account for the ſucceſſive burſtings."

" Theſe things being noticed, let us conſider (ſays Guattani) the poſture of a man ſtraining under a heavy weight, ſlipping one foot, and ſtriving to ſupport himſelf upon the other! let us ſee what would happen. The Tendo Achillis is tenſe, the Gaſtrocnæmii muſcles are in full action, ſo alſo is the Triceps through the tendon of which the artery paſſes; and the tenſion of the triceps, by ſtraitening its tendon, muſt compreſs the artery, hindering the blood from moving

freely downwards in it. The aorta and iliac veſſels are ſtrongly compreſſed by the abdominal muſcles and femoral ligaments. The blood thus detained in the middle portion of the artery muſt greatly diſtend, and force its ſides ſo that they will not eaſily recover after this preſſure is removed, eſpecially when the arterial ſyſtem is weak, as in this man it was, by a conſtitution naturally delicate, in conſequence of frequent diſeaſes, and the exerciſe of a trying profeſſion."

" This aneuriſm (ſays Guattani) proves, if I argue correctly, that whenever the blood of the main artery is obſtructed, it paſſes along the inoſculating branches; and in this caſe there is reaſon to believe, that the obſtruction had been a cauſe of burſting too ſudden to allow of the gradual enlargement of the inoſculating arteries."

The whole theory of this important caſe reſts upon the facts. From this hiſtory of the diſſection we are referred to the plate, which I have copied below. Inſtead of that aneuriſmal dilatation and great ſeptum or partition which we almoſt expect, we find a drawing of a plain, undilated, lacerated, and rugged artery. The whole drawing repreſents but ſix inches of the artery, and the diſeaſed part is ſo ſmall that there is plainly no room for any remarkable aneuriſm, eſpecially for two aneuriſmal ſacs.

Guatanis Drawing

The artery is of its natural diameter (as the author indeed declares) both above the diſeaſe and betwixt the two aneuriſmal dilatations. There is no large aneuriſmal ſac, nor any thing which ſhould indicate that there had been a great enlargement of the artery. There is that thickening of the arterial coats which is ſo frequent in advanced years; there is a ſeparation of the coats, and a ſlight dilatation, which indicates the prediſpoſition to diſeaſe; but there is no aneuriſm

diſtended to burſting; there is no natural aneuriſm converted by burſting into falſe aneuriſm. The previous dilatation was ſuch only (Guattani himſelf acknowledges it) as might prediſpoſe to laceration; but the actual violence was a laceration of two inches in length, and Guattani plainly attributes that laceration to the preſſure of the muſcles, and to the ſudden ſtrain, which happened a whole year previous to the fatal termination of the diſeaſe.

On the authority of Guattani himſelf, I repeat this as a remarkable example of an artery yielding directly under the ſtrong action of the muſcles; and I deſire you to obſerve, 1ſt, How well this great artery is ſupported by its cellular ſubſtance, and how ſlowly it overcomes the reſiſtance of its own ſheath; for had this been a natural aneuriſm, dilating ſlowly for a year, and burſting then by mere extenſion, the appearances on diſſection would have been very ſingular. 2d, You will remark, how, when the ſheath burſts, and the cloſer cellular ſubſtance which immediately ſurrounds the artery is torn! the blood eſcaping among the muſcles tears the cellular ſubſtance in the interſtices of the muſcles from time to time with ſucceſſive lacerations and ſucceſſive injections of blood. 3d, How the limb is ſupported by the main artery while its ſheath continues firm, and while the blood is confined to the natural channel. And here alſo I muſt remind you that this caſe is an additional proof of the limb ſurviving the total burſting of the artery ſupported by the inoſculating arteries, not only againſt this loſs of its main artery, but alſo in ſpite of the oppreſſion of extravaſated blood injected among the muſcles, and ſwelling up the whole limb, and oppreſſing it to ſuch a degree, as entirely to prevent the pulſe of the aneuriſm.

And yet there may be a ſort of miſgiving in your mind, that this was not a burſting of the artery; that the ſtrain cauſed ſome injury, which injury might bring on diſeaſe and dilatation of the veſſel; while the ſenſe of inward lacerations in the laſt days of this man's life might be nothing more than the giving way of the veſſel thus dilated. But I will remove all ſuch doubts, by demonſtrating to you that the artery is actually ruptured by the ſtrain, and that the progreſs of the diſeaſe, the time of its enlargement, or the degree of extravaſation, depend altogether on the manner in which the artery is ruptured, or on the exertions of the limb; for it is the occaſional exertion that cauſes thoſe inward hæmorrhages by which the aneuriſm is from time to time enlarged.

" A man of about thirty-four years of age was taken in the laſt week of April with a cramp, a little below his ham, which was followed by an immediate ſwell-

ing of the calf of the leg, attended with exceſſive pain, and it continued in much the ſame ſtate for about three months, when the pain began to increaſe, and the ſwelling to enlarge. The whole leg was exceedingly tenſe, but there was not the leaſt pulſation to be diſcovered in it, nor the leaſt viſible diſcolouration of the integuments. However, from the deepneſs of its ſituation, as well as from the ſudden enlargement and the violence of the pain, it was preſumed to be aneuriſm, and on that preſumption the operation for aneuriſm was attempted on the 15th of October."

" Upon opening the tumor, the coagulated blood appeared to have acquired a fleſhy conſiſtence, and adhered very firmly one portion to another. Upon removing it totally, the tibia and fibula were found carious, and the ruptured artery appeared juſt between the heads of the tibia and fibula, ſo that it was impracticable to tie it, or at leaſt judged unadviſable, conſidering the condition of the leg."—" It was amputated above the knee upon the ſpot, and the patient did well *."

Here this moſt important fact is proved in all its circumſtances. The ſudden rupture of the artery, the ſlow growth of the tumor, the want of pulſation (which is the uſual characteriſtic of aneuriſm), but above all the inevitable deſtruction of the bones, and the incurable nature of the diſeaſe! the eaſe with which the artery might have been tied at firſt, and the neceſſity of amputating the limb in the end, are important leſſons. In this unfortunate caſe, ſix months had elapſed from the burſting of the artery to the final conſummation of the diſeaſe; the ruptured artery appeared during the operation betwixt the heads of the tibia and fibula; and this firſt report muſt have been corrected by the diſſection of this limb after it was cut off, ſo as to leave no queſtion concerning this principal fact. If a cramp only of the limb could thus decidedly burſt the artery, what may we not apprehend from violent ſtrainings of the limbs, blows, and falls?

We thus perceive, that the very ſlow growth of an aneuriſm is perfectly compatible with the moſt deſperate wound, or total laceration of a great artery; and I will farther prove to you, that every artery of the human body, great as well as ſmall, forms its aneuriſm very ſlowly.

I have already explained, that every aneuriſm in the arm, when occaſioned by an accident in bleeding, proceeds from a direct wound of the lancet; and moreover that the artery is in general almoſt entirely cut acroſs, and yet the aneuriſm

* *Vide* Warner's Caſes in Surgery.

of the arm grows very ſlowly. In one caſe, where the operation was performed by a gentleman, a ſurgeon in Leith, the artery was ſo entirely divided, that the two ends hung together merely by a tag. In further evidence of the arterial trunk having been entirely cut acroſs in that caſe, and the courſe of the blood through the inoſculations eſtabliſhed, I remarked, that the moment the ligature upon the artery was drawn, the pulſe was felt diſtinctly in the wriſt; it was, indeed, ſtrong before the operation, and ſeemed to be little changed by tying the artery; yet this aneuriſm grew ſlowly; it was operated upon in the fifth week; and even then had not acquired any uncommon ſize, being hardly bigger than the fiſt.

It muſt not be forgotten, that the faſcia of the arm, and eſpecially over the bend of the arm, is ſingularly ſtrong; that the artery lies in cloſe contact with the faſcia, is felt diſtinctly beating under it, and is ſometimes ſo prominent as to appear through the ſkin, like the artery of the temple; that while the artery is thus ſuperficial, ſo as to be expoſed to laceration by blows, or even by ſtrains, it is ſo cloſely preſſed by this faſcia, and ſo well ſupported by its own peculiar ſheath, which lies immediately under, that its aneuriſm grows very ſlowly.

Mr. Morrell of Paris, the celebrated ſurgeon, was called to the neighbouring village of Corbeille to viſit one Jean Baptiſte Porcher, who kept the inn of St. John the Baptiſt. He found him with a large aneuriſm in the bend of the arm, ready to burſt, and requiring immediate operation. But as Porcher wiſhed to have the operation performed at his own houſe, Mr. Morrell, on account of his avocations in Paris, ſent Saviard, a man of no leſs reputation, in his ſtead.

When Mr. Saviard arrived, the friends ſeemed to be anxious leſt the diſeaſe ſhould be attributed to the patient having been bled in the arm about ſeven weeks before by a country ſurgeon. They wiſhed to have this queſtion decided before the operation, and the judge of the village would have adminiſtered an oath to Mr. Saviard. "The oath, ſays Saviard, I reſolutely declined; for being a ſworn ſurgeon of Paris, the ſolemn oath I took on that occaſion ſhould be relevant to any occaſion, and over all the diſtrict." "And though I was aſſured, ſays Saviard, of the innocence of the ſurgeon, from his bleeding having been performed in the cephalic vein, which takes its courſe high in the arm, far from the direction in which any artery could be wounded; yet I choſe to defer my evidence till after the operation, both that I might repreſent the circumſtances more expreſsly, and that I might hurry myſelf into no abſurd declaration; for though the cephalic vein does uſually run in a direction where there is no artery, yet there may be ſuch a luſus naturæ,

ſince the moſt celebrated and creditable practitioners have acknowledged that they have pricked an artery when they thought to open only the cephalic vein *."

But all this reaſoning had in truth no relation to the caſe. This accuſation had ariſen from the petulance and envy of a low and ignorant ſurgeon of the ſame village. The artery was burſt, and that with a very wide laceration. " This aneuriſm," ſays Mr. Saviard, " aroſe ſuddenly, in the preceding harveſt, from his own natural impetuoſity; as he was driving a cart loaded with corn, it ſtuck deep in a ſlough or rutt; he hooked his right arm under the wheel to lift it out, and ſtrained with ſuch impatience and violence that he hurt his arm, and ſuddenly cried out, " My arm is broken!" The aneuriſmal tumor began immediately to appear in the bend of the arm, and gradually increaſed till no longer able to bear it, Porcher was ready to ſubmit to any operation his ſurgeons might adviſe."

" Having ſcrewed his tourniquet, Saviard ſtruck his great abſceſs lancet into the heart of the tumor; then running it upwards he ſlit up the tumor, and with probe-pointed ſciſſars he opened it downwards. Having thus opened the tumor in its whole length, he introduced his fingers, took out the coagulated blood, and letting go the tourniquet he ſaw the opening in the artery, which was an inch in length, with ragged edges (" don't les bords etoint tout dilacerez"). He then ſcrewed the tourniquet again, demonſtrated to the aſſiſtants that the artery was not pricked with the lancet, but fairly lacerated; and having thus exculpated the unlucky ſurgeon, he proceeded in his operation and tied the artery."

There is no caſe of aneuriſm in which we are more ſenſibly ſtruck with the ſlow progreſs of the diſeaſe, than in wounds of the lower extremity; for if any artery ſhould prevail over the reſiſtance of the ſurrounding parts, it ſhould be the popliteal or femoral artery; yet, when the aneuriſm ariſes from a direct wound of that great artery, the diſeaſe proceeds as ſlowly as in thoſe caſes where the burſting of the artery is more doubtful, viz. where the diſeaſe has ariſen from a ſtrain of the limb.

" A valet was wounded by a ſabre in the lower part of the thigh cloſe to the ham, the point of the weapon touching the popliteal artery. The outward wound healed, and there enſued a circumſcribed aneuriſmal tumor, about the

* *Qu.* Can this be a fact which theſe creditable practitioners allege? Did the accident which they mention, proceed from a high forking of the humeral artery, one of the branches paſſing obliquely acroſs the arm?

ſize of a turkey's egg, beating ſtrongly and viſibly; it increaſed ſo very ſlowly, that more than two months ſeem to have elapſed from the time of the wound before the ſurgeons could reſolve on performing the operation." This is but a ſlow growth even for a natural aneuriſm, eſpecially for the aneuriſm ariſing from the wound of ſo large an artery as this, and yet, if I be not deceived, this artery was not merely wounded, it was entirely cut acroſs. The patient being laid flat upon his belly, Mr. Duſchamps, aſſiſted by M. M. Chopart, Pelletier, Bayer, and other eminent ſurgeons of Paris, made his inciſion upon the tumor, along the courſe of the artery. He firſt cut through the ſkin and cellular ſubſtance; the great nerve being then diſſected, and hooked aſide with the fingers of the left hand, he cut into the aneuriſmal ſac, ſlit it up its whole length, turned out the clots of blood, and waſhed and ſponged the cavity of the ſac; then both the extent of the ſac, and the wound in the artery, were diſtinctly ſeen. The artery was abſolutely cut acroſs, and you might even have introduced your finger into the open mouth of the artery *.

The femoral artery itſelf hardly forms its aneuriſm more rapidly than the popliteal artery did in this inſtance. I ſaw a young man whoſe femoral artery was wounded with a penknife. The gentleman who was firſt called to him, perhaps, was not aware that the blood proceeded from the great artery. The day following the aneuriſm began to form, but as yet the wounded artery was not ſo far removed from the faſcia and ſurface of the thigh but that pure blood found its way out through the integuments, and he loſt at a few ſtrokes of the heart no leſs than three pounds of blood; but on the third day the coagula were ſo firm, the wounded artery ſo deeply buried under the coagulating blood, and the external wound ſo ſteadily compreſſed, that it healed. The aneuriſm then aſſumed its proper form of a great pulſating tumor; and it was at the diſtance of three weeks

* With ſo many circumſtances of the deſcription coinciding, I have not the ſmalleſt doubt that the artery was cut acroſs. Whether the author means, that the wounded artery preſented itſelf during the operation, en bouche beantè, I am not ſo ſure. I tranſcribe the paſſage, and leave my reader to judge for himſelf. For the concluſion that I mean to eſtabliſh, it is enough that the artery was wounded with the ſabre.

" Alors, en écartant le nerf avec les doigts de la main gauche, j'agrandis l'ouverture du ſac haut et bas. Ceci fait, j'ôtai tous les caillots; je lavai et epongai exactement tout l'inteuer du foyer: Celui-ci parfaitement à ſec, j'obſervai ſon etendue et *le lieu de la bleſſure de l'artère:* elle ſe preſentoit à la vue d'une manière bien ſenſible; *élle etoit entierement coupée,* le déſordre, dans cette partie, étoit tel, que l'on *pouvoit facilimeut introduire le bout du doigt dans le lieu* ou l'artere avoit été coupée."

from the time of the wound that the operation was performed upon an aneuriſmal ſac, ſo ſmall and circumſcribed, that the limb in general was but little ſwelled, and this ſmall, circumſcribed, and beating aneuriſm was entirely limited to the upper and fore part of the thigh.

If you look into that caſe related by Mr. Burchall ſurgeon in Mancheſter *, (one of the earlieſt caſes in which the operation for femoral aneuriſm was performed with ſucceſs,) you will find a true picture of the manner in which a great artery when wounded forms its aneuriſm; it grows, indeed, as ſlowly and as gradually almoſt as if the aneuriſm were ſpontaneous, i. e. from a dilatation of the arterial coats. The aneuriſm operated upon by Mr. Burchall happened from the following accident: Iſaac Aſhton, a ſtout healthy young man, about thirty-five years of age, was ſitting in a careleſs way cutting a rag or flaw from the root of his nail, and the ſciſſars, which were very ſharp pointed, dropping betwixt his thighs, he ſuddenly clapped his knees together to catch them, and ſtruck the points directly into his thigh, and wounded the femoral artery. The blood inſtantly ſpurted out from the wounded veſſel, but the bleeding was ſoon ſtopped, and the external wound healed up in a few days. Then a ſmall tumor formed in the thigh; it was growing larger, and was ſomewhat painful, when he conſulted a gentleman in the country, who tried various remedies in vain. To this gentleman ſurely the ſymptoms of aneuriſm had not appeared very deciſive, nor the tumor very formidable; but it grew gradually more painful, and increaſed ſlowly in ſize. The man was now ſent to the town of Mancheſter for advice, where his diſeaſe was ſoon recognized as an aneuriſm of the femoral artery; and the operation was accordingly performed with the happieſt ſucceſs; but ſo ſlowly had the aneuriſm of this great artery increaſed, that the man lingered three months in the country after the accident! He was brought into the hoſpital at Mancheſter on the 28th of February; it was the 4th of March before the operation was performed, more than three months after the wound.

But where the femoral artery is not merely wounded, but entirely cut or broken acroſs, it will no doubt form its aneuriſm more rapidly, perhaps in three weeks, inſtead of three months, as happened in a caſe which occurred to my friend Mr. Harkneſs. The patient was maſter of a ſmall trading veſſel belonging to Borrowſtounneſs, a very ſtout athletic man, about forty years of age. Six months

* *Vide* Medical Obſervations and Inquiries, Vol. III. p. 106.

before he had broken his thigh bone, the fracture was healed, but had been ſet ſo clumſily, that the lower end of the broken bone projected upwards like a trochanter! The whole weight of the body reſted very obliquely upon the thigh, which was manifeſtly in danger from future accidents; yet while the bones continued united, the leg was ſtrong and ſerviceable.

One day, in loading ſome goods into his veſſel, he ſlipped his foot, and fell; though this limb never actually touched the ground, the callus had ſnapped acroſs, the bones paſſed one another, and the femoral artery partly by the angle which it made over the prominent end of the broken bone, and partly by the ſharpneſs of the bone itſelf, was torn almoſt entirely acroſs. Even this aneuriſm did not increaſe very ſuddenly, and never acquired a very great ſize; it formed for itſelf a regular ſac, and moreover, when near burſting, loſt its round and circumſcribed form, and became flat. It is eaſy to imagine that an artery in theſe circumſtances could not be well ſupported by its cellular ſubſtance; for the bones had been but lately reunited by a callus, they were now broken again, and all the ſurrounding cellular ſubſtance deſtroyed; there was already, as it were, a cavity prepared for receiving the blood of the artery; accordingly the moment the man's foot ſlipped under him, he felt extreme pain from the various parts which were lacerated, and even that night the tumor began to form! The next day the tumor was large, and pulſated very ſtrongly, and in a few days its pulſation was ſo powerful as to raiſe the bedclothes. But from the time in which the artery began to be reſiſted by the thick muſcles and faſcia of the thigh (for the aneuriſm lay altogether under the belly of the vaſtus internus), it hardly increaſed in ſize; it remained quite ſtationary for a fortnight or more; even the pulſation, which had begun to be very powerful, was in ſome degree deadened by the accumulation of blood and the preſſure of the ſurrounding parts, and ſomewhat reduced by the enlargement of the collateral arteries. The limb preſerved its natural heat and circulation; every thing was favourable to the bold attempt of ſaving a limb at once fractured in its bones, deprived of its main artery, and loaded with a great aneuriſm. This operation was once agreed to, but a ſecond conſultation condemned the limb to be cut off! it was cut off, and the man died.

Thus we perceive, that even the great femoral artery, although entirely torn acroſs, forms its aneuriſm but ſlowly. The amputation of the limb, in this caſe, was performed the fourth week after the fracture of the bone and burſting of the

artery, and yet the aneuriſm had attained but to a moderate ſize. The diſſection of the limb, which I ſhall preſently deſcribe, will ſhow, that the force of the blood condenſes the ſurrounding cellular ſubſtance into a firm ſac. The whole caſe, when we come to reaſon upon it, will be found to preſent to us an intereſting view of the ſtate of an aneuriſmal limb, and to prove the extreme danger of amputating, and the propriety of riſking the operation of aneuriſm even in the moſt deſperate circumſtances *. But, at preſent, I go on to prove, that even when the aorta itſelf burſts, it forms its aneuriſm very ſlowly, and does not by any means prove immediately fatal.

An officer of diſtinction, about forty years of age, was wounded in the battle of Fontenoy, and from his long confinement to bed he fell into bad health. He was diſtreſſed during his confinement with nephritic complaints, and ſoon after his recovery was ſeized with vomiting and ſpitting of blood. He went to Briſtol Wells, recovered his health, and continued for nearly ten years to live a careful and regular life, attentive to his exerciſe on horſeback, to his diet, and to the quantity of wine he drank.

About ten years after theſe complaints he ſeems to have been ſuddenly ſeized with very inexplicable diſtreſs, which ſoon ended in his death. He began firſt to complain of want of reſt, teneſmus, gripes, and mucous ſtools, ſtreaked with blood. Theſe ſymptoms were appeaſed by ſome draughts of oil, manna, and rhubarb, but the watchfulneſs continued. The patient felt more than uſual pain in his belly, eſpecially in the left ſide, he feared a return of his gravelliſh complaints, and about a month after this firſt attack he conſulted Sir John Pringle. A hiccup had come on, the pain was now conſtant, ſharp, darting to his back, groins, and teſticles, it was eſpecially ſevere when he turned to his right ſide, but he never attempted to turn upon his left. Theſe were the deciſive marks of ſome organic diſeaſe. The diſorder was quite unaccountable. His pulſe was quicker, harder, and fuller than natural. He had ſome degree of thirſt, but his head was clear. Such was the degree of watchfulneſs, that for ſix

* Perhaps there is no caſe in which the ſlow progreſs of the aneuriſm of a great artery is more remarkable than in that of Stewart the leech-gatherer, related in the Chapter on Wounded Arteries, who was wounded with the point of a pair of ſciſſars in the hip, and the glutæal artery was cut entirely acroſs. He received this wound in ſtepping out of a boat in one of the moſt northerly counties in Scotland, Caithneſs or Roſsſhire. His aneuriſm was in not the ſmalleſt danger of burſting when he came under my care, though he had been wounded ſix weeks before, and had travelled on foot and in carts more than three hundred miles.

weeks he had not been ſenſible of ſlumbering half an hour; for the laſt three weeks of his life he was hardly ſenſible of having even cloſed his eyes. His feet, he obſerved, were ſometimes benumbed, which made him call for more wine than uſual; and though he had no ſickneſs at his ſtomach, his appetite was gone. He was bled, but as he grew daily weaker they were afraid to repeat the bleeding, and for his hiccup, he took muſk and abſorbents without effect. Opiates were not omitted; and both on account of the hiccup, and in order to procure ſleep, laudanum was given, at firſt in ſmaller doſes, but his phyſicians were ſoon obliged to give it to the amount of one hundred drops during the night, without checking the hiccup, or obtaining ſleep, but it raiſed a general perſpiration. He ſeemed after this to be relieved; his ſpirits revived, the pain ceaſed; but this was the deceitful prelude to death. On the day of his death, he continued all the morning wide awake, ſenſible and in good ſpirits, but with an inceſſant hiccup. About four in the afternoon he called for drink, but before the ſervant could warm it, he ſuddenly expired.

The diſſection of this gentleman's body proves to us a very unprecedented fact, that the aorta itſelf ſometimes gives way; that the aneuriſm which its laceration forms is hardly more rapid in its growth than that of a ſmaller artery; that the ſac which it forms out of the looſe cellular ſubſtance is firmly attached to the artery, as if the aneuriſm had ariſen from mere dilatation. The abdominal viſcera were ſound, but there was a tumor larger than the fiſt, of an oblong figure, lying cloſe to the ſpine by the ſide of the aorta deſcendens, and in the direction of that veſſel. It began as high as the emulgent arteries, deſcended nearly to the pelvis, and was of a very firm conſiſtence. It was found to conſiſt of coagulated blood condenſed in the cellular ſubſtance, and under the adjacent parts of the perioſteum were ſome detached parcels of extravaſation. This abdominal portion of the aorta along with its tumor, were diſſected out of the body, together with a part of the thoracic aorta and of the common iliac arteries, and the middle part of the aorta being laid open through its whole length, there was obſerved in the ſpace, between the emulgents and lower meſenteric arteries, a complete rupture of all its coats. The aperture had lacerated edges, was big enough to admit the point of the diſſector's thumb, and led into a tumor which now appeared to be a SPURIOUS ANEURISM of the GREAT ARTERY, that is, a ſac formed of the cellular membrane, containing blood of different degrees of coagulation, which apparently had iſſued at different times from the aorta.

The neatneſs of this diſſection prevents all thoſe doubts which puzzle us in

caſes leſs correctly related; but the caſe is written by Sir John Pringle, the diſſection was performed by Hunter, the tumor was not firſt mangled, more canino, and then the connections and cauſes of it ſtated in idle conjectures. The aorta was ſlit up on that ſide which was ſound. The diſſectors ſaw clearly the connection of the tumor with the artery. The artery was burſt, the laceration had ragged edges preventing all ſuſpicion of previous dilatation, the breach was ſuch as to admit the diſſector's thumb, and was proportioned to the ſize of the artery. The ſac was formed in the cellular ſubſtance condenſed in proportion to the driving of the blood, and it adhered ſo to the artery as to be cut out along with it, and certainly would have been reported by leſs dexterous diſſectors, as a natural aneuriſm which had burſt. The blood was collected by ſeveral ſucceſſive extravaſations; the artery making (according to the exertions of the body) ſucceſſive impulſes againſt the cellular ſubſtance and againſt the peritoneum, which ſerves as the ſheath for this veſſel. For our entire ſatisfaction in regard to the nature of this diſeaſe, we, in another paragraph, learn alſo the cauſe, for "the aorta was not dilated above the aperture, but its coats were at that place harder than natural, as if tending to oſſify, and having loſt their natural elaſticity and toughneſs, were parted aſunder *."

Here then is the greateſt artery of the body burſt! fairly torn aſunder, and that without any ſtrain or blow †. The greateſt artery of the body, not ſupported like the femoral artery by a peculiar ſheath, nor bedded in firm cellular ſubſtance of muſcles, but merely covered by the peritoneum and lodged in the looſe cellular

* "Upon the review of the whole, we conclude that a ſmall apperture had at firſt been made at this weak part of the aorta, ſome conſiderable time before the death of the patient; that the tumor had been gradually formed of the oozing of the blood into the cellular membrane ſurrounding the artery, and which thereupon was dilated into that ſac mentioned above." Vid. Sir John Pringle's Medical Eſſays and Obſervations of Edinburgh, Vol. III.

† Mr. Elſe obſerves, That "the arteries ſometimes become ruptured without any previous dilatation. I have (ſays this author), a preparation of the aorta aſcendens, appearing in no place dilated, which exhibits two ruptures, one is ſmall, and ſituated about half an inch diſtance from the valves, from which a coagulum was formed about the ſize of a large nutmeg, that was ſeated between the trunk of the aorta and the trunk of the pulmonary artery. From the white appearance of the coagulum, and the regularity of the edges of the rupture, it ſeemed to be of long ſtanding. The other rupture is much larger, ſeated at the curvature between the exit of the right and left carotid arteries, the edges of which are torn and irregular, and formed a tumor, which preſſing againſt the lower part of the trachea, and the branches of the bronchia, deſtroyed the patient by ſuffocation in leſs than a month from its firſt riſe, and before there was any appearance of an external ſwelling.

ſubſtance of the kidney, is yet ſo ſupported as to form its aneuriſm very ſlowly. The blood is forced into the cellular ſubſtance by ſucceſſive impulſes. The ſac is fairly circumſcribed, and forms an oblong tumor not much bigger than the fiſt, though of conſiderable length, lying cloſe to the ſide of the artery, and ſo connected with it as to be cut out along with it; well may ſuch a ſac be miſtaken for that of a natural aneuriſm in bungling diſſections! That every ſurgeon is able, in bloody operations in the ham or thigh, in aneuriſms lying cloſe under the heads of the gaſtrocnæmii muſcles, to diſtinguiſh what is the ſac of a true, and what of a falſe aneuriſm! what ariſes from the dilatation of the artery, and what from the cellular ſubſtance, is not to be believed.

Thus have I proved to you, that an artery is ſometimes dilated gradually, ſometimes is hurt in its coats, but very often is burſt, lacerated, or entirely broken acroſs. That after being burſt, it is ſupported by its ſheath. That the cellular ſubſtance receives the blood; while the breach in the artery thus walled up with coagula, forms its aneuriſm ſlowly; that the greateſt arteries of the body form their aneuriſms ſlowly, and have the cellular ſubſtance and arterial ſheath beaten into the form of a diſtinct ſac; and that an aneuriſm which truly ariſes from a laceration of the artery may be miſtaken for a natural aneuriſm or ſimple dilatation of the tube!

## CONCLUSION.—CONTAINING A DESCRIPTION OF VARIOUS ANOMALOUS CASES OF ANEURISM.

To what practical uſes theſe ſpeculations may be applied, you will next inquire; for, unleſs they have ſome influence on practice, your intereſt in them ſhould be but very ſmall. You will remark that no ſooner is it proved to you that an artery may be burſt by a ſtrain of the limb, than you begin to look upon certain accidents which are apparently trivial, in a new and ſerious light. In the caſe of a direct wound of an artery, ſucceeded by a large tumor, with ſtrong pulſation, and all the characteriſtic ſigns of pure aneuriſm, you can be at no loſs to diſtinguiſh the nature of the diſeaſe. But too often it happens, that when this diſeaſe begins in a ſprain, when the pain is great, the pulſation ſmall, and the whole member ſwelled to a great ſize, the general ſwelling conceals the particular ſwelling of the aneuriſm, and

the limb is deſtroyed before the ſurgeon is aware of the nature of the diſeaſe. Theſe are the caſes which are ſo generally called anomalous, or, in other words, caſes which are not underſtood. The ſurgeon is unwilling to believe that an artery is burſt by a ſtrain of the limb, juſt as a hernia is forced down by any ſudden exertion; and while the ſurgeon remains ignorant of the nature of the diſeaſe, the artery is actually burſt, and is pouring out its blood among the muſcles; the bones are corrupted, the joint too is preſently deſtroyed, the whole limb is ruined in its texture, ſwelled, cold, and lifeleſs. The ſurgeon cuts it off, and being as little expert in anatomy as judicious in ſurgery, he, upon finding bones, blood, and matter mixed in one confuſed maſs, learns by his diſſection nothing more than he did by his previous inquiries; he calls it an anomalous caſe! a poor apology this word anomalous, for ignorance, which has coſt the patient a limb. But theſe are not the leſs aneuriſms, becauſe of our being ignorant of their nature and origin, and of that proceſs by which they come to this laſt ſtage of irregular ſuppuration.

This compreſſion of the ſoft parts, this caries of the bones, and deſtruction of the joint; this mixture of blood and matter; this confuſion of aneuriſm, caries, and abſceſs, with a putrid fluid, like coffee-grounds, and a ſurface nearly gangrenous, is indeed the final termination of every neglected aneuriſm; but there are certain occaſions in which the diſeaſe infallibly aſſumes this form. Firſt, Wherever the aneuriſm is produced by a broken bone, for there the artery is wounded or broken on the ſide next the bone, the blood is poured out under the bellies of all the muſcles, the reſiſtance to its outward extenſion is great, and the inward deſtruction of parts is proportionably rapid. Secondly, When the aneuriſm happens in the ham, or under the bellies of the gaſtrocnæmii muſcles, for there the aneuriſm is peculiarly ſtraitened, it is pent up betwixt the ham-ſtring tendons, it forms ſlowly, is ſingularly hard, and frequently has neither the pulſation nor other marks of aneuriſm; but the knee joint being deſtroyed, the bones corrupted, and the limb enormouſly ſwelled, is fit for amputation long before the tumor threatens to burſt! even amputation is not ſafe! Thirdly, But moſt of all, the limb is in danger when the caſe is not underſtood; when the artery is not wounded, nor gradually dilated, but actually burſt; for the ſurgeon, little accuſtomed to think of this burſting of an artery, never apprehends the true nature of the complaint, nor even knows it for aneuriſm! After having amputated the limb, his exculpation conſiſts in calling it an anomalous caſe, intimating that it was unintelligible and incurable.

## OF ANEURISM FROM FRACTURE OF THE BONES.

Aneuriſm, from fracture of the bones, is more or leſs important according to the artery that is wounded, and the other circumſtances of the caſe. In a fracture near the ancle, the artery is ſmall, the aneuriſm ſuperficial, the reſiſtance outwardly is ſlight, whence the bones within are proportionably leſs endangered. In ſuch aneuriſm behind the ancle, in the Fibular Artery, for example, the tumor ſhould be opened, the artery tied, and then the bones reunite, but till you have tied up the artery, you have in general no reunion of the bones. We find that this aneuriſm alſo grows very ſlowly, in ſo much that ſometimes it hardly appears till after the callus is formed, and the patient begins to walk. There are indeed exceptions to the general rule, for the fracture ſometimes heals while the aneuriſm goes on. "A ſurgeon of Guand, being called to ſet a broken leg, applied the uſual bandages, and in the uſual time accompliſhed the cure. But when the young man began to walk abroad, a tumor was obſerved behind the ancle, over the place where the bones had been broken, the ſurgeon (now called again) being ignorant of the nature of the diſeaſe, applied a cauſtic, but when he opened the eſchar, inſtead of matter which he expected, blood guſhed out ſo impetuouſly, that it was ſtopped with great difficulty. The young man fainted in the moment of this hæmorrhagy, and expired in two days after *."

When the artery is of another order, larger and lying deep among the muſcular fleſh cloſe upon the bone by which it has been lacerated, the caſe is more unfortunate, and if neglected, too frequently terminates in mortification and death. The tumor cauſed by ſuch an artery is large and diffuſed, the coagula of blood which oppreſs the limb are very large, and conſequently the pulſation is not diſtinct and ſmart, but heavy and throbbing. Knowing, as you do, the principles of ſurgery, you need not be informed, that before the pulſation can deſtroy the muſcles or make its way through the ſkin, the bones muſt be irrecoverably carious, and the ſoft parts round them deſtroyed by extravaſated blood. That if the oppreſſion be allowed to increaſe, the limb will fall into gangrene, or the ſkin burſt and the patient bleed to death. And you muſt be ſenſible, that if the ſkin be left to burſt from this gangrene, you muſt then ſearch for the artery and tie

* Palfin, Page 341. This is a rare exception to the general rule, that ſuch complicated fracture cannot heal till after the artery is tied. In this caſe, probably, the artery had formed a ſmall ſac for itſelf, diſtinct from the lacerated cavity formed by the fractured bones.

it, with but a poor chance of ſucceſs, the extravaſation having quite ruined the texture of the limb. If again the oppreſſion be allowed to increaſe till the limb become generally ſwelled, cold, lifeleſs, and in danger of gangrene, you muſt cut it off, without perhaps the conſolation of ſaving even the patient's life, for ſuch a limb is apt to run into gangrene.

When an artery, then, is thus lacerated, along with fracture of the bones, you have but this alternative to cut the limb off at once, if it be very deſperately wounded, or to try to ſave it by making inciſions (as in ſimple aneuriſm), and tying the artery! If you call a conſultation, it is not to decide ſo clear a point, but to ſatisfy the friends and exonerate yourſelf. The fracture is already complicated with aneuriſm, and you are under the dangerous neceſſity of converting this complicated aneuriſm into a compound fracture! You apply your tourniquet, make a long and deep inciſion, turn out the coagula of blood with your fingers, cleanſe the ſac with ſponges, ſearch for the artery and tie it up. You waſh out the blood from the ſac with ſyringes and ſponges, for while it lies betwixt the bones they cannot unite; what blood you are forced to leave melts down into bad matter and flows off; the deeper parts of the wound gradually digeſt, granulate, and fill up with ſoft fleſh; and when the continuity of the parts is thus reſtored, the new bone or callus begins to form. Such is the activity of a wounded artery in forming its aneuriſm and deſtroying the ſurrounding parts, and ſo complicated is the diſorder when a wounded artery is added to a fractured bone, that unleſs theſe operations are performed early, the limb is inevitably loſt.

But when the main artery of the limb is wounded, the aneuriſm often forms very ſlowly, and the blood being effuſed under the great muſcles of the limb, the pulſation is very indiſtinct. In one place firm coagula, together with the injection of the cellular ſubſtance makes the tumor hard and firm, and there the pulſation is not felt; but in another part, the walls of the tumor, in the interſtices of the extended muſcles, are thin, and there pulſation is perceived. The whole integuments of the limb inflame and thicken with effuſion into the cellular ſubſtance, ſo that the nature of the diſeaſe is very uncertain, the caſe is miſunderſtood, the parts are left to ſuffer all thoſe changes which the accidents of the caſe may induce.

During the progreſs of this effuſion, the inoſculating arteries are enlarged, enſuring the ſafety of the limb, and adding force to the other proofs of aneuriſm being ſeldom fatal from abſolute gangrene; while the bone itſelf undergoes changes much more remarkable than thoſe of the ſoft parts. Of theſe changes,

I know none more ſingular than that kind of exoſtoſis which exudes as it were from the bone, forming ſometimes a large and regular cavity, or branching out into the moſt irregular ſhapes. When a bone is broken and the great artery wounded, the blood is extravaſated betwixt the ends of the bone. The aneuriſm is formed within the lacerated perioſteum, the fracture becomes a part of the aneuriſmal ſac, the internal parts of the ſyſtem of the bone cannot reunite, and granules and ſplinters of bone are accordingly found, at a great diſtance of time, floating looſe, as if half diſſolved in the aneuriſmal blood, while the ends of the broken bones remain rough.

But the condition of the perioſteum muſt chiefly be regarded, for being part of the ſyſtem of the broken bone, it is capable of generating new bone, and the form of that bone will be regulated by the parts upon which it may be moulded. The perioſteum being now expanded into the form of a cyſt over the broken bone and aneuriſmal blood, its new ſecretion of bone will ſpread over the aneuriſm. The outſide of the perioſteum is ſtill connected with the muſcles and other ſoft parts, it is nouriſhed and receives its veſſels from without, and lives, and thickens, and begins a ſecretion of bone. The ſecretion while it is in this unnatural extended condition is very powerful, and the bone which is formed by this dilated or expanded perioſteum, is not only firm, but broad like a ſcull. We often ſee the lacerated perioſteum and the membranes of fractured and luxated joints, or of carious bones, forming great bony caries or ſtalactitic-like projections. In gun-ſhot wounds, with fractures of the upper part of the thigh bone, in the ſcrophulous caries of the hip joint, in luxations of the thigh bone from the acetabulum, in fractures of the cervix femoris, in compound fractures and luxations of the wriſt, and in fractures of the ſhoulder bone, bony cavities are often formed as big as the head of a new born child. In caſes of aneuriſm, it is more difficult for the perioſteum to live, or to form thoſe bony cavities, but when ſuch cavities are formed, they are filled with blood like coffee-grounds, and conſtitute a moſt irregular, or as it has been termed, anomalous diſeaſe; and round the outſide of ſuch bony cavities go the enlarged branches of the artery, which preſerve the limb notwithſtanding of all this diſorder. It is in ſuch caſes that we are almoſt at a loſs to ſay, whether aneuriſm or exoſtoſis has moſt ſhare in forming this fatal tumor.

I ſhall illuſtrate this ſpecies of mixed aneuriſm, by relating a caſe which was communicated to me two years ago by my friend Dr. Jeffry profeſſor of ana-

tomy in Glaſgow, whoſe abilities and zeal are univerſally known *. Dr. Jeffry had the goodneſs to ſend me along with the preparation, from which I have made theſe drawings, the following ſhort narrative of the caſe :

" An old woman of about fifty years of age was rode down in the ſtreets by a cart, and her arm broken in two places. One of thoſe fractures was about two inches above the elbow, the other was above the middle of the arm, and the whole bone was greatly ſhattered ; yet this poor creature had no aſſiſtance, no ſurgeon was called, the arm remained unattended to for ſix weeks, when Mr. Parlane, a ſurgeon in Glaſgow, viſited her and found the arm greatly ſwelled, ſo that he could neither diſtinctly underſtand the nature of the injury nor the condition of the bone ; it was preſumed that there was a fracture, and the patient was laid in a poſture favourable to the reunion of the bone."

" The tumor never ſubſided but increaſed, occupied the whole arm from the elbow to the top of the ſhoulder ; pulſation was diſtinctly felt at the top of the ſhoulder, but of ſuch a kind as might proceed from ſome artery near the ſurface, it was judged to be really ſo, the idea of an aneuriſm certainly had never ſtruck the gentleman who attended her, for he opened the tumor which was ſoft and fluctuating, there was no doubt of its containing a fluid of ſome kind or other ; the lancet was ſtruck into it, but inſtead of matter, as was expected, blood flowed in a full ſtream."

" This puncture healed up eaſily, the tumor which had ſubſided when it was thus imprudently opened, ſoon filled up again to its full ſize, and the hand and fore arm became œdematous and cold. In this condition the patient ſurvived five months, the tumor pulſating manifeſtly, eſpecially in its upper part ; but how this woman died, or after what kind of ſufferings, is not related in the caſe."

" On opening the body after death, eight months and more having elapſed from the time of the fracture, a profuſion of mixed and putrid blood like coffee-grounds was diſcharged. Two inches of the lower part of the bone retained its natural form, all the middle part of the bone was deſtroyed, the head only remained on the upper part of the tumor, but with its cancelli quite eroded, no-

* It is not natural to mention a friend of Dr. Jeffry's rank in our profeſſion, without ſome marked teſtimony of reſpect and attachment. Yet I will not preſume to expreſs in this note, the ſentiments I feel towards Dr. Jeffry, whoſe name ſhould rather have appeared in the moſt diſtinguiſhed and reſpectful place in my book.

# First Drawing of Aneurism with extensive ossifications within the Aneurismal Sac.

Explained p. 341.

6 The Arteria Circumflexa humeri encircling the Sac within.

8 The Tortuous and enlarged branch of the humeral Artery by which the Arm was supported.

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thing being left but the mere ſhell. Through the whole length of the bone, the cancelli were completely diſſolved, and the outer bony lamina were found adhering to the whole inner ſurface of the ſac, many pieces of the bone were found in the heart of the tumor, and on the fore part and middle of the tumor was found, one piece of bone two inches and a half long and nearly two broad."

" Although the humeral artery was injected, it could not be perceived from what branch of it the tumor was produced."

By turning now to the two drawings of this diſeaſed arm, you will underſtand the whole nature of the diſeaſe. In Number Firſt are ſeen, 1. the head of the os humeri, and, 2. the lower part of the bone, with the condyles; theſe alone remained, while all the reſt of the bone was deſtroyed by caries or (as the older phyſiologiſts would have expreſſed it), melted down among the aneuriſmal blood: 3. is the great aneuriſmal ſac, and it will now be underſtood how the perioſteum formed the outer ſac of the aneuriſm; how the blood (for this immenſe cavity was filled with blood) occupied the place of the callus, prevented the reunion of both fractures, and kept the whole length of the bone in that ſtate of caries by which it was at laſt entirely annihilated: 4. marks the thickneſs of the ſac, the adheſion of the muſcles to the outſide of the ſac, and thus the manner of its nouriſhment is to be explained! The perioſteum was thus the only part of the ſyſtem of the bone which continued to live; and being everywhere ſupported on its outer ſurface by the uſual concourſe of veſſels from the ſurrounding parts, we have no reaſon to wonder at its continuing to ſecrete bone among the lamellæ of its own ſubſtance: 5. ſhows the oſſification which I have juſt explained; it is deſcribed in the body of the caſe as if this large flat and broad piece of bone were merely the remains of the os humeri, unfolded ſomehow by the extenſion of the tumor; but it has nothing in common with a cylindrical bone, ſuch as the os humeri. This is a large flat oſſification, generated by the perioſteum, ſupported in this action by the ſurrounding ſoft parts. This oſſification is a fourth of an inch in thickneſs, reſembles one of the flat bones of the ſcull; it might be compared with the parietal bone, but that it is much thicker; it is three inches and a half broad, and ſix inches long. This is no expanſion of the humerus, it is a generation of new bone, and of a very ſingular ſize; nor is this the only bone that has been formed by this diſeaſed perioſteum; on the contrary, the whole of the aneuriſmal ſac is lined with bones, or in the very few places where the ſac is ſtill ſoft, you feel it beginning to harden with ſpecks and ſpots of oſſification within the centre of the mem-

branes. This piece of bone, marked 5 5, is indeed the thickeſt and ſtrongeſt part of the bone, and has been laid entirely bare by the diſſecting away of the fore part of the ſac; but it is not the fifth part of the whole quantity of the bone; for the ſac is entirely lined with bone, which gives it this ſtiff balloon-like ſhape.

Figure 2. explains the aneuriſmal arteries, by which all this diſorder had been produced. It is a lateral view of the arm, and ſhows the humeral artery and its enlarged branches bending round the inner ſide of the tumor. 1. and 2. mark the upper and lower parts of the os humeri, the only parts of the bone that remains. The head, 1. has its cancelli deſtroyed; it is, as it were, laid upon the top of the ſac, upon introducing your finger from within, you feel that the head of the bone is a mere ſhell: 3. marks the outer ſurface of the great ſac; and now it is diſtinctly ſeen how the perioſteum and thickened cellular ſubſtance which forms the ſac, is ſupported by the muſcles which lie over it. In this view are ſeen, (a) the coraco brachialis muſcle, (b) part of the biceps, and (c) the deltoid muſcle ſtretched upon the ſurface of the ſac, expanding along with it, and theſe muſcles are thin in their fibres, but ſtill healthy: 4. ſhows the thickened edges of the ſac, and the manner in which the perioſteum and the muſcles form the two lamellæ of the ſac: 5. ſhows the great oſſification, nearly four inches broad and more than five inches long; for in the ſecond figure 5. you ſee only the lower part of the ſame firm piece of bone. At (d) are ſeen the remains of the thickened capſule and other parts which ſurround the head of the bone; and of the muſcles you ſee in this drawing (a) the remains of the coraco brachialis, (b) of the biceps, (c) of the deltoid muſcle, (e) marks the triceps extenſor cubiti lying flaccid all along the back part of the arm.

And now I come to deſcribe the ſyſtem of the diſeaſed arteries: (f) marks the axillary artery injected, and tied at the place where it begins to aſſume the name of brachial artery; here it gives off the branches which belong to the ſcapula and to the joint, (g) is the great ſub-ſcapular artery tied very cloſe to the trunk. 6. is the arteria circumflexa humeri, ſo named from its bending round the joint; and here it is marked 6. becauſe it is the ſame artery which is ſeen in the firſt drawing bending round the inner ſurface of the ſac. (h) is the continued trunk of the brachial artery. (i) a ſmall muſcular branch. (k) the profunda humeri ſuperior, or upper muſcular artery of the arm, the muſcular ſpiral branch of which goes in a ſpiral form under the belly (e) of the triceps muſcle. (l) is the place where the humeral artery

# Second Drawing of an Aneurism with extensive ossifications within the Aneurismal Sac.

Explained page 342.

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ſeems to divide into two branches of equal ſize, and ſeems as if there had been in this caſe a high forking of the humeral artery, but, to a pathologiſt, the original trunk and the enlarged inoſculating artery are eaſily diſtinguiſhable; for (h), the continued trunk of the humeral artery, though partaking equally of the injection with the other trunk, is lank and ſtraight, while the enlarged inoſculating artery is remarkably tortuous. 8. then, as was ſeen in the firſt drawing, is known to be the enlarged inoſculating artery, firſt, by the direction in which it comes off from the main artery, viz. nearer the bone; ſecondly, by the part of the arm at which it comes off, demonſtrating it to be the branch named Profunda Inferior; thirdly, by its tortuous form, which ſhows it to have been enlarged; fourthly, by its place, for in the preparation it is tied down firmly to the inner condyle of the ſhoulder bone. This proves clearly, that though this has the appearance of a diviſion of the trunk, it never could have croſſed the bend of the arm at the place of bleeding, it is merely the enlarged inoſculating branch of the profunda inferior, of which a ſmall branch (m) is ſeen going in under the triceps muſcle, juſt as the branches of the profunda ſuperior do. 7. is the great baſilic vein bending over the tumor, and which is ſeen alſo in the other drawing.

We need but to review in the hiſtory of this caſe, a few circumſtances in order to underſtand the whole diſeaſe in the moſt unequivocal manner. Firſt, The ſudden riſing of the tumor, the ſwelling of the whole arm, the fluctuation, the pulſation in the upper part of the tumor, prove, that though the chief part of the tumor is found upon diſſection to be bony, yet aneuriſm, and not exoſtoſis, formed the baſis of the diſeaſe. Secondly, The ſtriking of the lancet into the tumor ſhows, that there was blood very early; the ſudden filling up of the tumor to its full ſize, after having been punctured with the lancet, ſhows that the artery was open at that time, and throwing its blood freely into the ſac; and finally, the bony cavity being filled at the time of death with nothing but corrupted blood, which always after long delay aſſumes the appearance of coffee-grounds, proves the tumor to be merely an aneuriſm! but it is a complicated aneuriſm, it is combined with a fractured bone; and the condition of the perioſteum accounts for the generation of ſuch extenſive plates of bone, equal to a cranium in ſize, and ſomething like it in the breadth and flatneſs of the oſſifications. Thirdly, It being proved that the diſeaſe was aneuriſm, it is next to be obſerved, that there is not belonging to the humeral artery, as to the femoral, a great profunda, or collateral branch, as large as the trunk itſelf; there are but two muſcular branches in the arm, and thoſe not larger than

crow quills; there is no artery except the trunk itſelf equal to the production of ſuch an aneuriſm. The branches which run on the inner ſurface of this tumor, as at figure 6. are all ſingularly well injected, which ſhows that none of theſe had any ſhare in producing the aneuriſm; and ſurely none of them had terminated in the bag; even the force of the injection had not burſt their moſt delicate branches; they were full of the injection, and the bag empty. While the entireneſs of theſe branches proves that they had no ſhare in forming the aneuriſm, the enlargement of the profunda inferior, 8. to ſuch a ſize as to rival the trunk itſelf in diameter, is another proof that the trunk was wounded below the point (n) where it is tied, for nothing but the wound of the trunk (h) could thus enlarge the profunda.

This is one of thoſe caſes in which, as I have expreſſed myſelf, one is almoſt at a loſs to decide, whether aneuriſm or exoſtoſis has the greater ſhare in forming the diſeaſe. The confuſion of the caſe is almoſt an apology for any miſtake of the ſurgeon; yet the ſuddenneſs of the tumor, the pulſation, the blood following the lancet, were ſigns too concluſive to allow of any doubt. There muſt have been in a certain ſtage of this caſe ſuch œdema, oppreſſion, coldneſs of the limb, and ſuppreſſion of the pulſe, as might have intimated to the ſurgeon that the change in the ſtate of the circulation had taken place, on which the fate of ſuch a limb depends. The patient living with an aneuriſm certainly proceeding from the rupture of the great artery; living alſo under ſuch a complicated and oppreſſive diſorder, fracture, exoſtoſis, and extravaſated blood, proves to us that there is hardly any caſe in which we need deſpair; and the enlargement of all the arteries in this limb, is authority for performing the operation for aneuriſm, even when the main artery is ruptured, along with a fracture of the bone.

A limb, from this combination of fracture and aneuriſm, often falls into ſuch diſorder that it is cut off, the ſurgeon himſelf not knowing why. The etching, No. 5. which is put upon the ſame ſheet with the etchings of Mr. Harkneſs's aneuriſm, is the ham of a man whoſe leg was cut off in a public Infirmary in this country, but his caſe was very imperfectly recorded: "The diſeaſe was a compound fracture; the tibia and fibula were fractured obliquely near the heads of the bones, and were much ſplintered; the limb ſwelled immenſely after the accident; but though the limb was ſet, and the bones replaced, the ſwelling did not as uſual ſubſide, but, on the contrary, it was diſcovered a few days after, that the tumor was of a fluid nature. It was punctured with the lancet, but no-

thing iſſued except grumous blood, and the probe went down into a large cavity filled with coagula. It was now reſolved to open the tumor very freely, and many large coagula of blood were taken out. The tumor being thus cleared of its contents, a large deep-ſeated artery ſprung, and the leg was immediately cut off."

This is the uſual ſhort proceſs: the ſurgeons had gone too far in digging into the centre of a diſeaſe which they did not underſtand; when they took out the coagula, they might have expected florid blood! but their hurry and alarm prevented any conſultation on the caſe, and they cut off the limb. Yet, however raſh we may think this operation, it was at all events better to look into the diſeaſe thus early, and cut off the limb, than leave the aneuriſm to make the bones carious, and deſtroy the joint. In looking on the ſketch we perceive, that the fibula is broken near its head, and has a large ſplinter (a), which has torn the artery at (b). We perceive, that this hole in the artery is juſt at the forking of the main artery into the tibial and fibular arteries; we are ſenſible, that ſuch a wound is equal to a total rupture of the main artery; and ſince this man's limb continued thus to ſurvive the loſs of its arterial trunk, ſince we alſo find the articular artery (c), and the curling muſcular branch of gaſtrocnæmii (d), conſiderably enlarged, we have every reaſon to believe, that had the artery, when it thus threw out its blood, been ſimply tied, the iſſue of the operation would have been fortunate.

This brings us naturally to the ſecond cauſe of this anomalous form of the aneuriſm, viz. its being confined within the narrow cavity of the ham.

## PECULIARITIES OF POPLITEAL ANEURISM.

In all caſes of neglected aneuriſm, this deſtruction of the ſoft parts, and caries of the bones, is the laſt ſtage of the diſeaſe. But in popliteal aneuriſm, whether proceeding from ſpontaneous dilatation of the artery, or ariſing from ſtrains, fractures or wounds, the danger is peculiar; for the aneuriſm is ſo confined under the bellies of the gaſtrocnæmii muſcles, and betwixt the tendons of the hamſtrings, that the reſiſtance to its extenſion is very great, the deſtruction within is proportionably rapid, and the diſeaſe is always attended with ſevere pain.

The popliteal artery bends over the condyles of the thigh bone, paſſes behind the knee joint, and is affected by every motion of the joint. It alſo lies under the gaſtrocnæmii muſcles, whence it is endangered by every ſtrain of a limb

which is very powerful, and which continually ſupports the whole weight of the body. The diſeaſe, when it happens in the ham, correſponds but too well with the theory we have laid down; it is produced merely by a ſtrain, and ends often in total deſtruction of all the adjacent parts. A man, for example, has a fall from his horſe and hurts his ham, or ſtrains it in mounting his horſe; or his limb falls in betwixt the rounds of a ladder, and is violently and ſuddenly bent; or he receives a blow upon the ham, or he takes a ſudden cramp in the calf of his leg, and from that moment his pains and lameneſs begin. Whether the artery be merely ſtretched, racked and inflamed, or whether it abſolutely give way and burſts under ſuch accidents, is little to the preſent purpoſe, but thus it is that the diſeaſe begins, and is long unſuſpected by the ſurgeon, while the patient walks, or refrains from walking, by fits, as the pain happens to be more or leſs violent, rubbing the part perhaps with camphorated oil.

Thus all parties continue indifferent to one of the moſt fatal diſeaſes. The ham is ſtraitened, whence the tumor, even from the firſt, is of a ſtony hardneſs. From this ſtraitneſs it loſes very early the marks of aneuriſm, for the pulſation often ceaſes, or is very obſcure. The tumor (even in natural aneuriſm of the ham) is not always clearly circumſcribed, nor to be fairly traced to any connection with the artery; and being covered, and its pulſe ſuppreſſed by the great thickneſs of the muſcles and ſkin, the nature of the diſeaſe remains unknown. From the ſame preſſure the leg becomes very early cold and œdematous; for the veins, lymphatics and artery, all paſs in this ſtraitened cavity of the ham, the preſſure upon theſe produces a general ſwelling of the limb, and the general ſwelling conceals the particular tumor. From the elevation of the bellies of the gaſtrocnæmii muſcles over the tumor, and from the diſtenſion of the ham-ſtring muſcles, the limb is thrown into ſevere and painful cramps; and from the nerve paſſing over the tumor (preſſed ſometimes quite flat), a very diſtreſſing numbneſs is always felt, and the lameneſs and pain are ſuch as the external ſwelling cannot account for. All theſe diſtreſſes of pain, cramps, ſwelling, and general numbneſs of the limb increaſing every day, the patient ſometimes dies of locked jaw, fever, or long ſuffering and want of reſt, the diſeaſe becoming fatal before that period arrive in which the tumor burſts.

Every ſtep in the progreſs of this diſeaſe, even that enlargement of the inoſculating arteries, which is ſo much wiſhed for by the ſurgeon, removes the diſeaſe farther from the poſſibility of a cure. When at laſt we do operate, we

find in boring through the coagulated blood, that our finger enters among carious bones, or paſſes into the cavity of the knee joint, we are ſenſible that to perſiſt in the operation were vain and cruel; the leg is too far gone, and muſt be cut off! and when we amputate, we are conſcious that, in a limb ſo ſwelled and diſordered, there is the utmoſt danger of gangrene. Every part of theſe deſcriptions argues for deciſion and early operation; it is a diſeaſe more inevitably fatal than cancer or gangrene; death or amputation are the ſure conſequences of delay; but an early operation may be ſucceſsful, and early amputation is ſafe.

In proof of this, allow me to obſerve, that when the artery burſts under a ſtrain, and the aneuriſm is ſo ſuddenly formed, ſo painful, ſo rapid in its increaſe, that the ſurgeon is obliged to perform his operation upon the ſpot, he is ſure to ſucceed. Warner relates ſuch a caſe, apparently from memory, in few words, but very deciſively; the general impreſſion of the caſe upon his mind ſeems to have been very ſtrong. "Some years ago the operation for aneuriſm was performed in a ſimilar caſe within a few hours of the rupture of the veſſel, the tumor increaſing ſo faſt, and the pain proving ſo intolerable, that it was neceſſary to loſe no time! The tibialis poſtica was burſt in the middle of the leg; it was taken up with ſome difficulty, and the patient recovered."

By this early operation we perceive, that while it is the lacerated artery which produces all this confuſion and diſorder of the joint with caries of the bones, the operation itſelf is certainly ſucceſsful when done before the extravaſation has hurt the texture of the parts; and we have next to contraſt, with the happy iſſue of this early operation, thoſe caſes in which the limb is cut off, after a few months delay. In a caſe formerly related, the diſeaſe proceeded not from a blow, a fall, or any external injury; the man was taken with a cramp in his leg; there was no pulſation, nor any other ſign nor characteriſtic of aneuriſm; but when, after ſix months, they ventured to perform the operation, they ſaw diſtinctly the mouth, "the orifice of the ruptured artery," but it was too late to tie it! the bones were carious, and they were forced to cut off the leg *; and in the caſe which I

* In the month of December 1756, J. Y. aged thirty-five, received an hurt *upon and about his knee, by falling to the ground from a man's back;* the accident was immediately followed by a conſiderable degree of lameneſs and pain, which were increaſed by walking or ſtanding; he continued in much the ſame ſtate for about ſix weeks after the accident, at the end of this time the calf of the leg was attacked with an œdematous ſwelling, and in a fortnight afterwards it became ſo painful as to diſable him from walking. The tumor continued to grow for about eight weeks, and at length extended itſelf ſo far upwards, as to affect

have printed on the margin below, you will find the ſame tragedy recited again, with but a ſmall variety in the circumſtances; go indeed to what collection of caſes you will, you find in almoſt every volume, under the title of an anomalous caſe, a ſtory of a neglected aneuriſm and amputated limb, and in every caſe you will ſee how little the ſurgeon had attended to the hiſtory of the diſeaſe, how little he expected blood, or a lacerated artery; you will obſerve what horror

the greateſt part of the thigh, the whole of which was attended with exceſſive pain, but more particularly ſo about the knee. Thus much is related from the patient's own account.

On the 28th of April 1757, he was admitted into Guy's Hoſpital under my care; upon examination, the thigh appeared enlarged to a very great ſize. The tumor was uniform, and extended from the inſide of the knee to within a ſmall ſpace of the groin; the integuments were in every part of their natural colour. Upon preſſing the inſide of the thigh it appeared ſoft, where a fluctuation was diſcoverable, but there was not the leaſt appearance of pulſation on this or any other part of the limb. The tumor on its ſuperior, poſterior, and lateral parts, was of a ſtony hardneſs.

The leg (which according to the patient's account) had ſome time ſince been much ſwelled, did not now appear to be at all ſo. He was continually in great pain, and for ſome time paſt had been incapable of taking his uſual reſt: his appetite was bad, he was a good deal emaciated, he had a conſtant ſlow fever, which began about five weeks before his admiſſion into the hoſpital; he appeared pale and ſallow in his complexion. From the time of his being placed under my care to the end of ten days, there was no apparent alteration in the ſwelling, nor in the ſymptoms attending it. In expectation therefore of affording him that relief which I thought could by no other means be given, I judged it adviſable to open the tumor, which I did by making an inciſion into its moſt prominent part, upon which there immediately guſhed out a large ſtream of thin florid blood, *and at this inſtant diſcovered to me the true ſtate of that diſeaſe*, which till now could not be aſcertained by any peculiar ſymptom diſtinguiſhable by the touch, or perceptible to the eye; ſeeing this, I immediately filled up the *wound with lint and tow, and proceeded in as expeditious a* manner as poſſible to apply a tight bandage upon the thigh near to the groin; and leſt this might accidentally break, I applied *a ſecond ligature* a little below the firſt, and proceeded *to amputate the limb upon the ſpot:* During the operation the patient fainted, but he ſoon came to himſelf again, and without any bad ſymptom, gradually recovered his health, ſtrength, appetite, and reſt, and is now in good health.

Upon a diſſection of the thigh and leg, I diſcovered the following appearances: A conſiderable part of the fleſhy portions of two of the extenſor muſcles of the leg, to wit, the Vaſtus Internus and Crureus, with the ſubjacent Perioſteum, were deſtroyed. Four of thoſe muſcles whoſe uſes are to bend the leg, and which compoſe the internal and external hamſtrings, to wit, the Gracilis, Semitendinoſus, Semimembranoſus, and Biceps Tibiæ, together with that adductor and flexor muſcle of the leg called Sartorius, were removed at a conſiderable diſtance from the inferior part of the thigh bone, and from the upper parts of the tibia and fibula; *by which means a large bed was formed for containing the extravaſation;* which conſiſted in part of a fluid, and in part of a coagulated blood; by much the greateſt portion of the coagulated blood was firm, and had acquired the texture and appearance of brown macerated leather. The ſeveral muſcles I have *mentioned had a livid and putrid appearance. The Os Femoris was carious on its anterior and poſterior parts*, and for the ſpace of ſeveral inches above the condyles of that bone with the courſe of the linea aſpera, as well as on the convex or anterior part of it, there were many exoſtoſes.

this unexpected hæmorrhagy excites, and with what precipitation and hurry the limb is cut off *.

Although it is very certain that aneuriſm is often unattended with pulſation, yet it is not unlikely that ſometimes thoſe collections of blood which fill the ham, and hurt the joint, and end in caries of the bones, proceed from ruptures of the he veins; for the veins, more delicate than the arteries, are expoſed to the ſame

The capſular ligament of the knee joint was much thickened, and contained about two ounces of a yellow and viſcid ſynovia.

* " *The hiſtory of a caſe affording a proof of the power of extravaſated blood in diſſolving bone.* Vide *Dr. Duncan's Commentary, Vol. VI.*

" A man of a ſtrong and healthy habit, aged about forty-five, upon lifting a heavy weight on the 1ſt of October 1777, *thought he felt ſomething give way in his right hip.* Immediately after he was very faint, but ſoon recovered, and for ſix or ſeven days followed his uſual occupation, which was that of a brewer's ſervant, with little inconvenience. During that time, he perceived *an unuſual weakneſs in the leg* and thigh, but attended with little or no pain, *and it was treated as a ſprain*, with ſpirituous and oily embrocations. At the end of three weeks his thigh was conſiderably ſwelled, and in ten weeks time from the accident (when I firſt ſaw him) it was very much enlarged, and the leg and foot œdematoſe. He had frequent returns of excruciating pain in that thigh, but it was ſometimes perfectly eaſy, and the other leg and thigh would be inflamed and painful; ſometimes he was delirious, at others had violent pain in his ſtomach, attended with great ſickneſs and vomiting, which could only be relieved by volatile and cordial medicines.

" As I was uninformed of the preceding accident, and could diſcover *no pulſation or fluctuation in the tumor*, the patient's hiſtory, together with the above ſymptoms favouring the ſuppoſition, I at firſt believed the diſeaſe to be entirely rheumatic. The thigh continued growing larger, till the 1ſt of January 1778, when it became very tenſe, in contiuual pain, and I could perceive a deep ſeated fluctuation. As he had no hectic fever or other ſymptoms that could induce me to ſuppoſe this *fluid was pus*, I began to ſuſpect a falſe aneuriſm. The tenſion and pain being exceſſive, I recommended *emollient fomentations and cataplaſms*, which, for a night, gave great relief, excepting when theſe pains, which by turns invaded every part of his body, were fixed in the diſeaſed thigh. On the 12th of February, the thigh was amazingly diſtended in conſtant and exceſſive pains, which nothing could alleviate, and a fluctuation was felt in every part of it, from the groin to the knee. At this time it was examined by a ſurgeon of ſkill and reputation, who, conſidering the exquiſite ſufferings of the patient, and being uncertain what was the fluid contained in his thigh, thought proper to open it; and accordingly a ſmall puncture was made through the ſkin, cellular membrane, and facia lata. Immediately there iſſued *a fountain of blood*, of the conſiſtence of cream, and a darker colour than blood is in general when freſh and drawn from a vein. When about a quarter of blood was drawn off, the thigh was conſiderably diminiſhed, and the patient eaſy. We ſtopped the orifice with a tent, and left the patient till morning.

" Feb. 13. He had fainted ſeveral times in the night, *and this morning the thigh was almoſt as much diſtended as before the inciſion was made;* at the ſame time, the blood was conſtantly oozing through the orifice.

violences as the artery, ſince they accompany it; and varices of the internal veins are capable of producing ſimilar effects with proper aneuriſms. The deſtruction of the bones ariſes not from the pulſation of aneuriſm, nor from any thing peculiar in the nature of the arterial blood, but merely from the injection of the cellular ſubſtance with the blood, together with the general preſſure, and the internal ulceration, from the preſence of a foreign body. Perhaps the ſudden riſing of a tumor

" Feb. 14. His thigh was in the ſame ſtate as yeſterday. He had a return of the pain in his ſtomach, which yielded to no medicine; in the evening he became delirious, had convulſions, and died.

" What induced me to lay this caſe before you was the appearance upon diſſection. That blood has the power of diſſolving bone, if it comes in contact with it in the living body, though a certain fact, yet it is not univerſally believed. This caſe not only proves the truth of that idea, but it alſo ſhows, that extravaſated blood, when long confined, has likewiſe the power of diſſolving the ſofter parts.

" Having cut through the integuments and tendinous faſcia of the thigh, I could paſs my hand quite round the bone, the muſcles, except their tendinous portions, being diſſolved to the conſiſtence of grumous blood, which, with a great quantity of pure blood, was contained, as it were, in a bag, formed by the integuments of the faſcia lata from the groin and criſta of the ilium to the joint of the knee. *The crural artery, vein, and nerve, were entirely diſſolved* (and yet the limb had ſurvived—obſerve how often this fact is obtruded upon us), and the iliac artery a little way was very tender. The os femoris *was deprived of its perioſteum*, very rough and full of holes, ſome of which would admit a probe into the middle of the bone, which ſeemed deſtitute of medulla. At the ſame time there were ſeveral exoſtoſes upon it, which were ſo ſlender as to be eaſily broke down by the finger. As I was not permitted to take away the bone, or to open the abdomen, I cannot give a more ſatisfactory account of the caſe; but I imagine it ſufficiently *proves the ſolvent power of the blood as exerted both on the ſofteſt and hardeſt parts of the ſyſtem.*"

Perhaps there cannot be pointed out to your obſervation a more intereſting caſe than this. How limbs may be cut off, or even life itſelf loſt, from not underſtanding the nature of ſuch a diſeaſe, is but too manifeſt; there was not one circumſtance of the caſe underſtood, and I hope there is not one which you can be at a loſs to explain. The corrupting of the bone, and the deſtruction of its perioſteum, are no more connected in the report than if bone and perioſteum were not alive, and had no more connection naturally with each other than the glove with the hand! The blood is conſidered merely as a menſtruum, capable of diſſolving bone, as an acid would diſſolve a calcareous ſtone! Nothing is attributed to the actions of the living body. An aneuriſm is ſuffered for four months to undermine the cellular ſubſtance, to choke, inſulate, and deſtroy the muſcles, to ſpoil the perioſteum, and by that to deſtroy the bone. This aneuriſm is tapped with a lancet, as if it were an abſceſs; the man faints from the inward bleeding of the artery, the ſac fills up before morning to its former ſize, the blood oozes through this imprudent opening, and the man dies. Inſtead of lamenting his fate, or of underſtanding the caſe, even after diſſection, it is related as an inſtance! of what? Why, of blood diſſolving bone. But I think it is an inſtance of ſomething much more important, and am perſuaded that nothing would be more uſeful to the public than a ſet of critical and monitory obſervations addreſſed to young ſurgeons, and attached to the many valuable caſes which are publiſhed in various collections. If God ſpare me health and ſpirits for ſuch a taſk, I will perform it.

from a ſtrain of the limb, a ſenſe of laceration in the part, the ſlow increaſe of the tumor, and the total abſence of pulſation through all its ſtages, may be eſteemed among the ſigns of a ruptured vein *.

## CONCLUSION.

I believe that little now remains to be done, except to draw the natural concluſions from this hiſtory of the diſeaſe.

1. We now perceive why the operation for popliteal aneuriſm has been ſo ſingularly unſucceſsful. The ſtraitneſs of the ham, the deſtruction of the ſoft parts, the preſſure upon the muſcles till they are hardly more alive than the coagulated blood which oppreſſes them, even that enlargement of the inoſculating arteries which ſurgeons have always wiſhed for, are unfavourable to our ſucceſs; delay is fatal! when the bones have become carious, ſucceſs is impoſſible.

2. The ſurgeon neglects the operation becauſe he is uncertain of the nature of the diſeaſe. The diſeaſe proceeds not from any wound or blow, but, on the contrary, the ſwelling and weakneſs are firſt obſerved immediately after a ſtrain of the limb. The ſurgeon is unwilling to believe that any ſuch accidents can give riſe to a true aneuriſm! That pulſation alſo, which he judges to be the only ſure ſign of aneuriſm, is often wanting, eſpecially in the latter ſtages of the diſeaſe.

3. It has been too much a faſhion among ſurgeons to ſay, at the end of any unſatisfactory conſultation, "Let us try this or the other operation;" and in difficult circumſtances the ſurgeon has often been known to make an inciſion into ſuch an uncertain tumor, merely to learn what it contains. This inquiſitive inciſion is often made without even the ceremony of a tourniquet about the limb, and when, to his utter confuſion, the blood of the popliteal artery daſhes out upon the operator, and the patient faints, he, in hurry and trepidation, "ties ſtrings about the limb," and proceeds ſtraightway to perform amputation, notwithſtanding the abſolute aſſurance of the limb being ſafe! For if the main artery be thus lacerated, and the limb ſtill ſurvive, what doubt can there be that

* In one caſe the diſorder was fairly traced to the veins. Mr. Elſe in his works relates a caſe of this kind, in which the limb was amputated on account of the caries of the bone. Upon throwing a wax injection into the arteries, it was not extravaſated in the tumor, but ran freely along the arteries to the foot. Upon examining the great vein, a rupture was found immediately above one of the valves.

But the other caſes, which Mr. Elſe believed to have been ruptures of the veins, were quite another diſeaſe, as ſhall be explained preſently.

the inoſculating arteries are enlarged, and that the limb lives by them alone? Indeed, the reaſon which ſurgeons give for cutting off the limb, viz. that of being aſſured by the inciſion that the main artery is actually ruptured, is the very reaſon why they ſhould attempt to ſave it.

4. To finiſh all, When ignorant ſurgeons cut off ſuch a limb, they, after diſſecting it, deſcribe to us a burſt artery, with all its conſequences, as coagula of blood, matter like coffee-grounds, diſeaſed muſcles, carious bones, and a corrupted joint! nothing in their diſſection is wanting to prove the diſeaſe to have been a regular, but long neglected aneuriſm! But they call it an anomalous caſe, as if they were anxious to prove that they have learnt nothing more from their diſſection than from their previous inquiries into the hiſtory of the diſeaſe.

5. You will perhaps ſay within yourſelves, "What ſhould we do, to acquit ourſelves faithfully, in ſo difficult a ſituation?"—Reflect much upon the hiſtory of your patient's diſeaſe, write it down, ponder upon it, compare it with the deſcriptions of authors, it is a diſeaſe in which you never need be hurried into any imprudent act. Remember how frequently arteries are burſt, how ſlowly aneuriſm forms, and that when confined in a narrow cavity like the ham, or when buried under the thick muſcles of the thigh, when the ſac is old, and crammed with firm coagula of blood, aneuriſm may loſe its pulſation. Do not forget this general rule of ſurgery, which I have ventured to lay down, "Allow no tumor to grow to a dangerous ſize:" If a tumor have its ſeat about the throat, near the carotid arteries, or under the angle of the jaw; if it be in the groin, in the thigh, in the cavity of the ham; and moſt eſpecially if it be at once near a great artery, and a joint ſuch as the knee, deal with it early, and you will often in the courſe of your practice have the happineſs of preventing thoſe afflicting caſes which defy ſurgery.

6. In this particular diſeaſe, firſt aſſure yourſelf of its nature, ſubmit yourſelves to the advice of your fellow ſurgeons, open the tumor early, but not like thoſe ignorant men who are terrified at the ſight of blood! When the coagula roll out, you may be aſſured that an artery will bleed in the end; when you have cleared out the blood and let go the tourniquet, you will ſee the artery; when you perceive that the main artery is wounded, the limb being ſtill alive, you have reaſon to believe that the collateral arteries are enlarged and the limb ſafe, that you have but the common dangers of all ſuch caſes to encounter, viz. ſloughing, fever, and weakneſs. When the artery is but a branch, as the tibial artery, you may tie it with the greater

confidence; indeed, it is only when the joint is injured, or the bones carious, that you have to cut off the limb. When you ſee the mouth of a bleeding artery, you ſhould, in general, tie it with the needle, for it lies deep; when you find no artery, but obſerve a ſlow hæmorrhagy from a vein, a piece of ſcraped lint is ſufficient; when there is an oozing of blood from a deep part of the cavity, and from uncertain veſſels, you may thruſt down a piece of ſponge.

This neglected aneuriſm is the Anomalous caſe of Medical Collections, it is a diſeaſe for which Mr. Pott can find no other terms of deſcription than theſe, " A tumor which has its ſeat in the middle of the calf of the leg, or rather more towards its upper part, under the gaſtrocnæmius and ſoleus muſcles; it begins by a ſmall, hard, deep-ſeated ſwelling, ſometimes very painful, ſometimes little ſo, and only hindering the patient's exerciſes; it does not alter the natural colour of the ſkin, at leaſt till it has attained a conſiderable ſize; it enlarges gradually, does not ſoften as it enlarges, but continues through the greateſt part of it incompreſſibly hard, and when it has got to a large ſize it ſeems to contain a fluid which may be felt towards the bottom, or reſting, as it were, on the back part of the bones; if an opening be made for the diſcharge of this fluid, it muſt be made very deep, and through *a ſtrangely diſtempered maſs;* it either derives its origin from *a burſten artery, or at leaſt is always accompanied by it;* this is a complaint affecting the leg, *removeable*, as far as my experience goes, by amputation only." A certain cure, God wot, and perfectly chirurgical.

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But I muſt now conclude this diſcourſe, of which the purpoſe has been to inſtruct you in the various cauſes of aneuriſm. You will no doubt have obſerved, that how much ſoever we may attribute to prediſpoſition, aneuriſm ariſes more frequently from violence than diſeaſe; that it is not from any weakneſs, or from its dependent poſture, that the lower extremity is peculiarly ſubject to aneuriſm. Though the muſcular force of the leg is infinitely greater than that of the arm, the artery of the leg cannot have power proportioned to the muſcular exertions of the limb, and the lower extremity is actually prone to aneuriſm from its ſuperior ſtrength! the artery of the thigh is diſpoſed to this diſeaſe by being long, tortuous, and ſubject to the preſſure of the ſtrongeſt muſcles in the body; the artery of the ham is endangered by the manner in which it perforates the tendon of the triceps muſcle, by its looſe unſupported condition where it arrives

in the ham, by its lying upon the capſule of the joint, and by the manner in which it is encloſed, between the two projecting condyles of the thigh bone.

You muſt have obſerved too, as I enumerated the cauſes of aneuriſm, that women are exempted from it, not becauſe of the ſofter texture of their ſolids, not becauſe their arteries are leſs prediſpoſed, (for I have found examples of the criſp, thickened, and dilated artery, and of diſeaſed and oſſifying aorta, with every other mark of prediſpoſition, more frequently by far in the bodies of women than of men), but becauſe they are almoſt exempted from labour; their muſcles are incapable of dangerous exertions; they live a quiet life; their buſineſs, their duties, their amuſements, are all domeſtic. I have not ſeen, nor read, nor heard of one woman having an aneuriſm in the ham.

Men only, and thoſe the ſtrongeſt of their ſex, coachmen, porters, ſoldiers, have aneuriſms. It is from the ſoft luxurious habits of men in the higher ranks of life that they eſcape; men like women are indeed exempted from this diſeaſe. It is from the ſuperior ſtrength and active labours of men in the lower ranks of life that they are ſubject to this diſeaſe. Nor is it conſtant labour and the perpendicular poſture that weakens the arteries, as it dilates the veins. Occaſional, ſudden, and bold exertions, only endanger the artery; it gives way ſenſibly in the very time of the ſtrain; and the pain from that moment never ceaſes till the limb is ſwelled to burſting, the joint immoveable and the bones deſtroyed.

It is by the ſurrounding cellular ſubſtance, the cloſeneſs of the ſurrounding parts, and the firmneſs of its own peculiar ſheath, that an artery is ſo long ſupported and forms its ſac ſo ſlowly after being thus lacerated. It is by occaſional exertions of the limb, and ſucceſſive hæmorrhages from the artery into its cellular ſheath, that the aneuriſm increaſes from time to time; when enlarged to a certain ſize, aneuriſm becomes irreſiſtible, and in the laſt weeks its progreſs is inconceivably rapid. When in the thigh, the diſeaſe has ſometimes been ſpontaneouſly cured; but when lodged under the joint it is almoſt inevitably fatal.

I hope I have laid before you the materials for ſtudy, and taught you a habit of reflecting and deliberating upon the nature of this diſeaſe.

# DISCOURSE VIII.

## ON THE CONDITION OF AN ANEURISMAL LIMB, FROM WHICH IS DEDUCED THE SAFETY OR DANGER OF THE VARIOUS OPERATIONS FOR THE CURE OF ANEURISMS.

We are now entering upon important ſpeculations, and I muſt begin by again repreſenting to you the condition of an aneuriſmal limb. For ſome weeks the great aneuriſm of the thigh increaſes with alarming and awful pulſation. The tumor is hard, firm, and painful, the pulſe throbbing and feveriſh, and the aneuriſm begins to inflame. The lymphatics and the great veins accompany the artery, and by the ſize of the tumor they are ſo compreſſed, that the whole limb ſwells, and the particular tumor of the aneuriſm is almoſt concealed by the general turgeſcence of the limb. The limb now lies out a heavy unwieldy maſs; the tenſion of it is very diſtreſſing; the cramps are frequent and terrible; the only motion in the limb is a ſort of trembling and convulſive twitching; the numbneſs is even more diſtreſſing than the actual pain; the man lies extended on his back, with great anxieties, unable to move his limb; he has reſtleſs nights and fearful dreams, and when the diſeaſe approaches to its laſt ſtage, he is quite exhauſted with fever and pain.

The laſt ſtage approaches in which the particular tumor now emerges from the general ſwelling of the limb; and in proportion as the proper aneuriſmal tumor riſes, the pulſation, or rather throbbing of the whole, becomes irreſiſtible. If the aneuriſm were in the breaſt, the very bones at ſuch period would be burſt aſunder. The ſkin begins to change its colour, the circumference is dark and inflamed, the centre is livid, all the upper part of the member is one great throbbing tumor! while all below is cold, inſenſible, powerleſs, and ſwollen as with a dropſy. Now comes that eventful period, which the patient ſeldom ſurvives; the ſigns of gangrene and death approach; the thigh becomes livid; the pulſation ceaſes; the gangrene ſeems begun. The limb itſelf is pa-

ralytic, cold, heavy, dead; the patient lies in that lethargic torpor which precedes death, and nature contends whether he live or die. But gradually the patient recovers from this deadly ſlumbering; the low delirium goes off; the fever ſubſides; the limb recovers its natural heat; the activity of all its veſſels ſeems to be renewed; but the pulſation in the tumor and in the courſe of the tumor is gone! The general ſwelling falls by ſlow degrees; the crammed and ſolid hardneſs of the limb gradually ſoftens; yet half a year generally elapſes before it is reduced to any ſeemly ſhape, or to any thing near its natural ſize. When the aneuriſm firſt loſes its throbbing, it is a ſign that the great artery is oppreſſed, ſoon to be obliterated, which obliteration is accompanied ſometimes with death of the member, ſometimes, though rarely, with a renewal of life. When the limb recovers its natural heat, without any renewed pulſation in the aneuriſm, it is a ſign that the main artery is obliterated, the collaterals enlarged, and the limb ſafe; and as the limb gradually ſoftens, we can, in the progreſs of the cure, force the points of our fingers down into the bed of the artery, and feel the remains of the aneuriſm and of the obſtructed veſſels like a firm and knotty cord.

This deſcription of the diſeaſe ſhows the nature of thoſe ſufferings of which the patient often dies without burſting of the tumor, or loſs of blood. Sometimes the tenſion of the limb is ſuch that the cramps riſe to the violence of convulſions, the patient expiring with a general convulſion of the whole body, along with ſlighter tremblings of the affected limb. Often the continued fever, the pain, the want of natural reſt, the horrid dreams, and the delirium produced by this ſcene of miſery, proves fatal. Sometimes though the whole limb is not tainted with gangrene, the aneuriſm itſelf becomes gangrenous, and the patient falls into the low delirium and dies. Uſually the lividity of the aneuriſm increaſes, the ſkin becomes thin, inflamed, dry, and chapped; it cracks; blood ſerum oozes out; ſometimes there is a detached eſchar ſupported by a clot below, riſing and falling with each motion of the pulſe; at laſt it burſts, and at one guſh he loſes two or three pounds of blood; he lies in a low and muttering delirium during the night; recovers ſomewhat in the morning, but is ſick and languid, and with the next ſlight guſh of blood expires.

But ſometimes the pulſation having ceaſed, the limb becomes cold only for a time, the heat returns and the patient is ſaved. There is a certain critical point to which, when the aneuriſm arrives, the ſtruggle betwixt the pulſation and the

reſiſtance muſt end ſuddenly. If the pulſation is to prevail, the parts become thin, the tumor burſts, and the patient expires. If, on the other hand, the reſiſtance be ſuch as to oppreſs the artery, then the pulſation does not all at once ceaſe, but the collateral arterties enlarge, and begin to carry off the blood from the aneuriſm at the very moment it threatens to burſt. By this change of circulation, the pulſation of the artery is weakened, ſo that the ſwelling, weight, and reſiſtance of the ſurrounding parts, and of the coagula formed within the aneuriſm, are able to reſiſt the ſtroke of the artery; its pulſation flags, and the collateral arteries enlarge; its pulſation at laſt ceaſes, and there is to be obſerved betwixt the loſs of one circulation and the eſtabliſhment of another, an interval of coldneſs and deadneſs in the limb. The circulation is thus for ſome time upon the turn, and when this critical period arrives, the limb is prepared for the happieſt changes, and no ſooner is the circulation in the great artery ſtopped, than that of the collateral arteries is ſubſtituted in its place.

But if this natural aneuriſm of the artery burſt, the blood can no longer go along in the ſame courſe; the artery being burſt, its blood is poured abroad into the cellular ſubſtance; the veſſel itſelf is obſtructed by the coagula, and oppreſſed by the continually increaſing tumor; if the ſkin alſo burſt at the ſame time, the patient expires. But where the ſkin reſiſts the aneuriſm a few days longer, the circulation in the main artery ceaſes, the artery itſelf is flattened and compreſſed, the collateral arteries enlarge, and the limb recovers from the interval of cold and numbneſs; the ſkin and cellular ſubſtance give way a few days after, but there is no loſs of blood, becauſe the channel of the main artery is already dry; and though the patient may die, exhauſted, yet the limb is ſafe. If it unfortunately happen that in the moment of this turn in the circulation of the limb, the ſurgeon takes the alarm, calls a conſultation and cuts off the limb! he finds that three or four arteries bleed from the interſtice of each muſcle, ten or twelve arteries bleed from the general ſurface of the ſtump; he has the mortification to perceive that he has cut off the limb in the very moment when nature was providing for its ſafety! his patient dies on the third or fourth day, from cauſes which I ſhall preſently explain.

This enlargement of all the ſmaller arteries implies a condition of an aneuriſmal limb, which, though hitherto unnoticed, is too full of important concluſions to be but ſlightly explained; and the condition of the aneuriſmal limb is ſtill the ſame, whether we perform the cure by tying the artery, or attempt it by com-

preſſion, or whether we neglect the aneuriſm till it obſtructs the artery and obliterates it by its preſſure, or burſts inwardly among the cellular ſubſtance. And I will undertake to prove to you, that it cannot be a matter of indifference to operate upon a limb in this condition.

When the celebrated Guattani found that the operation for popliteal aneuriſm was hardly practicable, and amputation itſelf no ſure refuge, he began to turn his thoughts towards the medical cure of aneuriſm! he hoped to invent ſome way of reſolving the aneuriſm by compreſſing the tumor itſelf, and diluting the blood contained in it. He at laſt ſucceeded in curing aneuriſm by long confinement, with compreſſion and firm bandaging; and he believed that he had repreſſed the aneuriſm, and actually ſaved the channel of the blood, by preſerving for it a free courſe through the main artery of the limb. I know it was univerſally the opinion of thoſe great maſters that they ſaved the channel of the artery, but I reſort to their works, not for their opinions, but for their facts; and to be plain with you, the more I ſtudy their facts, the more am I hardened in this infidelity with regard to their opinions.

Guattani was fully perſuaded that he reſolved the blood, ſqueezed and melted down the coagula, returned the fluid parts into the circulating ſyſtem, cleared the artery, repreſſed the tumor, and preſerved the circulation through the main trunk of the limb. I need hardly quote paſſages; I do not need to ſearch curiouſly for proofs of this doctrine! it was his only one, and every expreſſion in his book involves ſome proof of it. "When I reflected particularly," ſays Guattani, "on thoſe aneuriſms which occur in the limbs, I began to imagine, that by confinement to bed, by reducing the habit of the whole body, by compreſſing the artery ſo as to prevent the full flow of blood towards the aneuriſm, and by a gradual, ſteady, and ſlowly increaſed preſſure upon the aneuriſm itſelf, I ſhould be able, not only to prevent the further growth of the diſeaſe, but to accompliſh in time a complete reſolution of the clotted blood into ſerum, thin enough to return into the courſe of the circulation, and thus to diſperſe the tumor altogether *."

* Quum vero ea potiſſimum aneuryſmata inſpicerem, quæ in articulis oboriuntur, in ſuſpicionem adductus ſum, quiete cubilis, ac extenuatione totius corporis, nec non ſimul cohibendo ſanguinis curſum in arteria ad affectum locum tendente, ac denique linteorum beneficio ipſummet gradatim comprimendo tumorem aneuryſmaticum, fieri poſſe, ut non ſolum illius augmentum prohiberetur, ſed tractu temporis paulatim in *ſerum ſua ſponte converſo*, et *ad permeandum idoneo reddito ſanguineo grumo*, ipſius quoque tumoris omnimoda reſolutio tandem aliquando contingeret.

Guattani ſucceeded often in curing aneuriſms of the ham by compreſſion, and when he failed, his diſappointments are acknowledged ſo freely, as to prove him to be a truly great man. His ſucceſſes were unequivocal, but the proceſs by which he accompliſhed the cure is far different from this reſolution of the blood which he imagined. He performed the cure by ſpare diet, reſt, compreſſes, and a well rolled bandage continued for months; and I ſuppoſe theſe to have been the effects of his method. Firſt of all, this kind of preſſure reſiſts the further extenſion of the tumor, and the bandage, though ſevere at firſt, never fails, in a little while, by oppoſing the extenſion, to relieve the pain. In the next place, the artery being reſiſted in this outward direction, the limb is brought ſuddenly, but ſimply, into that ſtate which is ſo dangerous in the laſt ſtage of aneuriſm, for by this preſſure the artery is oppoſed, the circulation is leſs free, the blood is turned towards the collateral arteries, the limb remains for a few days cold and numbed, and is gradually prepared for the final cure. It is eſſential to your underſtanding this cure by compreſſion, that you obſerve the following fact: Aneuriſm is not what it has been repreſented, a fair round bag containing fluid blood, communicating freely with the artery; no aneuriſm is truly reducible by preſſure; aneuriſm is hard and firm, even of a ſtony hardneſs; were it otherwiſe, how could it reſiſt compreſſion for months? The aneuriſm, whether true or falſe, is filled with ſolid knotty coagula, and reſiſts perfectly. The very tumor itſelf ſerves as a compreſs for the artery, the preſſing down ſuch tumor compreſſes the artery betwixt it and the bone, and this is the true reaſon why a ſimple compreſs and a general roller cures aneuriſm, without thoſe cunning ſcrews and cuſhions which the older ſurgeons invented ſo ingeniouſly for making a partial compreſſion. The aneuriſmal tumor being itſelf hard and firm, conveys the compreſſion to the main trunk of the artery, which is compreſſed betwixt it and the bone, while the collaterals lodged among the ſound and fleſhy parts eſcape the preſſure.

Were the opinions of thoſe pathologiſts correct, that the blood were reſolved, the aneuriſm repreſſed, and the canal of the artery preſerved, the tumor ſhould yield at firſt, then become flaccid, then its blood ſhould be altogether diſcharged into the artery, and the artery ſhould be apt, on removing the bandage, to inject the empty bag and fill it again; in ſhort, the ſac of the aneuriſm ſhould be repreſſed as a prelude to the cure of the diſeaſe. Again, ſuppoſe (by ſome proceſs of the economy, which I cannot foreſee, and which ſurely never did happen), that this were really the ſucceſſion of the phenomena in this cure, the artery after ſuch a

cure ſhould carry its blood freely, the pulſe ſhould be as ſtrong as ever, and whatever remained of the tumor, though it were but a thickening of the parts, ſhould receive the ſtroke of the artery, and this reſiduum or remains of the tumor continuing to pulſate thus, the operator never could be aſſured of his cure, and would never lay aſide his compreſs.

But in truth the laſt ſtage of the proceſs is this: The artery being for ſome time oppoſed by the gradually increaſing tenſion of the parts, the blood is thrown upon the collateral branches; the blood paſſing along the collateral branches allows the compreſſion to be increaſed without that intolerable ſenſe of numbneſs and pain which the compreſſions of the firſt week cauſes. At laſt the compreſſion is ſupported boldly, firmly, unremittingly. If the operator ſtop ſhort of this, the diſeaſe returns; but if he entirely compreſs the artery, the blood forſakes it, the pulſation ſtops, the tumor remains ſolid and firm, and does not enlarge becauſe the blood no longer flows into it, nor does it even beat again, becauſe the artery which lies under it is obliterated by the preſſure. The artery is obliterated for months before the pulſation ceaſes, but the tumor never entirely diſappears, there always remains in the ham, a knot ſo firm as to reſemble an exoſtoſis of the bone, and ſo attached to the joint as to cauſe a degree of ſtiffneſs. It is only from ignorance of this proceſs that the operator does not leave off his compreſſion, when the tumor becomes ſtationary, when the pulſation ceaſes, when, in ſhort, the artery is obliterated; it is often continued, on the contrary, till it produces rigidity of the joint. Thus, we perceive, that Guattani, when he cured by compreſſion, had no reaſon to continue his bandages for years, nor to fear a return of the diſeaſe. He performed, in fact, a radical operation, he obliterated the artery as fairly as if he had tied it with the four tapes which have been ſo often uſed in this piece of ſurgery. But I will relate the manner in which he performed his cures, and you ſhall judge yourſelves whether the aneuriſm was repreſſed merely, or whether the artery was abſolutely deſtroyed.

" A porter, about forty years of age, of an athletic and ſanguine habit, had an aneuriſm of the ham as large as the biggeſt gooſe egg, hard, elaſtic, pulſating very ſtrongly, with fever and a general ſwelling of the limb. Guattani had reſolved to perform the operation for popliteal aneuriſm, but was willing to defer it till the ſwelling ſhould ſubſide. He laid the patient in bed, bled him and kept him to a very ſpare diet, and this was, providentially, ſo ſingularly uſeful, that not only the increaſe of the diſeaſe was arreſted, but in the courſe of little more

than a month, the pain entirely ceaſed, the violence of the pulſation was ſomewhat abated, and the general ſwelling was very greatly leſſened."

" Having to accompany the Pope during his retirement in the autumnal ſeaſon, Guattani thought it adviſable to delay the operation for three months; but finding upon his return the tumor nothing larger, and the general ſwelling of the limb quite gone, he reſolved to try the compreſs and bandage. He formed two long compreſſes, croſſed them over the centre of the tumor in the ham, and made their ends encircle the knee above and below. He laid alſo a compreſs up the thigh, along the courſe of the femoral artery, and with a very long roller, three inches broad, he encircled, firſt the knee, and then the thigh, finiſhing with one turn round the pelvis to keep it firm; from time to time he poured ſpirits of wine on the bandages, which, when well applied, kept firm for eighteen or twenty days. Every time they were renewed he drew them a little firmer."

" Though the tumor long preſerved its form, hardneſs, and pulſation, yet in the courſe of exactly three months the patient left the hoſpital perfectly cured; nor was any thing of this great tumor left, except a ſort of calloſity or hardneſs of the ſize of a bean. He returned to his buſineſs of a common porter, paid no attention to his diet, ſtrained frequently under the heavieſt loads, yet never had the ſlighteſt return, nor felt any greater inconveniency, than a trifling ſwelling of the foot and ancle."

" A year after, this man lay ill of an epidemic fever in the hoſpital, without the ham being in the leaſt diſtended by the increaſed force of the circulation; and ſince (ſays Guattani) neither walking, nor the exerciſe of his laborious profeſſion, nor this febrile increaſe of circulation, had in any degree diſturbed the ham, I am ſafe to conclude, that a free circulation of blood, even in the veſſels of the ham itſelf, was effectually reſtored *." Thus does Guattani affirm, in direct terms, that the canal of the popliteal artery is preſerved. But we ſhall judge, perhaps, more deciſively of his doctrine, after reading another caſe, where, though the proceſs of the cure is the ſame, the relation of the phenomena which attends it are ſomewhat varied.

" The ſecond cure was performed upon a man of forty-five years of age, a

* " Ad hæc, anno 1766, iis, quæ tunc temporis graſſabantur, febribus correptus quum eſſet, quum tertiani duplici laboraret, ad Noſocomium reverſus eſt, ibidemque amiſſam valetudinem perfecte recuperavit, abſque eo quod affectus poples, ex aucto per febrim ſanguinis motu, perturbationem ullam acceperit. Quum igitur nec ambulatio, nec labor, nec auctus a febri humorum circuitus poplitem quadantenus exaſperaverint, *rationi conſentaneum videtur omnimodum vel in articulo ſeſe per vaſa movendi redditam humoribus libertatem fuiſſe.*"

grave-digger. His aneuriſm was large, with pain, fever, a throbbing pulſe, and great ſwelling of the limb, but not particularly hard; you rather ſeemed to feel in it a ſort of fluctuation. But the cauſe was well marked; for " in the laſt week of July, he had hurt his limb in a very violent effort; it was while he ſtrained very hard in lifting the confeſſion-deſk from one part of the church to another, that he felt ſomething give way in his ham, with a ſudden pain, but yet bearable, ſo that he was able for ſome time to continue his labours. He was ignorant of the nature of his diſeaſe, and had uſed only the more harmleſs applications, till the time of his being laid in the Hoſpital of St. Peter's, under Guattani's care *.

" This man was brought to the hoſpital in the firſt week of Auguſt. For the firſt eight days he was bled, dieted, confined to bed, and reduced ſo that the ſtricture of the bandage might be ſafe and tolerable. Then the compreſſion was begun, carried on ſtep by ſtep, and occaſionally renewed; but on the firſt week of November Guattani found that the pulſation of the tumor had entirely vaniſhed, and the tumor remained moveable †" " Yet I failed not (ſays he) to renew the compreſſion, and with ſuch happy ſucceſs, that by the middle of January my patient left the hoſpital perfectly cured, excepting a halt in his gait, and that not remarkable." " Two months after I ſent for him to examine the parts, when I found in the ham nothing but a ſmall hardneſs, about the ſize and ſhape of a cheſnut, reſembling an exoſtoſis ‡."

There cannot be imagined a more correct hiſtory of an artery obliterated by

* " Quum ex eo quæreretur, a quanam cauſa ejuſmodi tumor obortus eſſet, reſpondit *ex valido niſu* quem in penultima tranſactæ quadrageſimæ hebdomada articulus fecerat. Dum enim cathedram ſacræ confeſſioni dicatam ab uno eccleſiæ loco in alium transferret, *ſe quamdam in poplite perſenſiſſe veluti divulſionem*, ex qua dolor emerſerat, ſed ita tolerabilis, *ut conſuetos labores ad* pentecoſten uſque continuaverit. Ab hoc autem tempore ad illud, quo ad noſocomium delatus eſt, quod tumoris naturam ignorabat, etſi augmentum illius videret, nullis, niſi ad leniendum dumtaxat dolorem, remediis quibuſdam vulgaribus uſus erat."

† " Primis igitur octo diebus ſat mihi fuit, ægrotanti in lecto quieſcenti rigidam imperare diætam, eique binas ſanguinis miſſiones efficere. Quo factum eſt, ut omnia lenirentur ſymptomata, tumorque mollitiem adhuc majorem nanciſceretur. Tunc ad aliquot alios dies linteis poſca madentibus uſus ſum, dein gradum feci ad compreſſivam, attamen mediocrem vincturam, quam pro neceſſitate iteravi, primiſque Novembris diebus, quum illam iterum inſtituerem, *deprehendi, pulſationem arteriæ prorſus evanuiſſe, ac tumorem omnino fluitantem fuiſſe redditum :* ſed nihilominus affectam partem faſcia ligare rurſus non deſtiti eadem methodo, quam in prægreſſa obſervatione adhibueram. Atque ita feliciter ceſſit, ut æger V. kalendas Januarias in ſtatum valetudinis priſtinum reſtitutus e noſocomio diſceſſerit, nullum aliud incommodum ſecum ferens, præter aliquam, eamque parvam claudicationem."

‡ " A precedente ſenſibiliter differet, non ſolum quod ab initio mollitiem aliqualem oſtenderet, longeque ante ſanationem omnino molle redditum eſſet, ſed etiam quod ante dies quinquaginta, integræ ſana-

compreſſion. The patient was bled, and purged, and confined to bed, which relaxed the parts, and the tumor was ſo compreſſed, that in the courſe of one month the pulſation diſappeared! The pulſation had diſappeared, though the tumor remained, which ſhows that there was not pulſation enough in the artery even to raiſe the tumor. The tumor was now moveable in the ham, yet nothing is ſaid of its connection with the artery; there was not even the ſlighteſt pulſation in the artery, to remind Guattani of that connection betwixt the now pervious artery and remaining tumor, which otherwiſe he would have deſcribed with ſo much care. He next performed a work of ſupererogation, for the artery was obliterated, the pulſation gone, the reſt ſhould have been left to nature; but he applied his compreſs and bandage again, and in the two ſucceeding months did no more than ſtiffen the ham.

But deſirous, after two months, of knowing the ſtate of the parts, he ſent for his patient again, examined the ham; and now he found that he had compreſſed the aneuriſm into a hard and bony knot, and had ſo fixed the tumor, formerly moveable (fluitantem), betwixt the condyles of the thigh bone, that it reſembled an exoſtoſis. Here again a new ſtate of the tumor is deſcribed, at the diſtance of three months from the time of the cure, and yet not one word of the artery nor its pulſation, no curious diſtinctions betwixt the pulſation of the artery now in its natural condition, and the diſeaſed pulſation which it had during its aneuriſmal ſtate. Here is deſcribed a tumor, firm in its own conſiſtence, and fixed to the joint and bones like an exoſtoſis. How could there remain any canal, artery, or vein in the ham under this tumor? We may be aſſured, that in this method of cure by compreſſion, juſt as in the radical cure by ligature, there is an entire change in the circulation of the limb!

Let us next obſerve, whether we have not the ſame marks of obliteration of the artery, even in thoſe caſes of ſpontaneous cure, where the ſurgeon thinks that the canal of the great artery is ſtill pervious. Mr. Blagden, ſurgeon at Petworth, was conſulted by * a man of about fifty years of age, tall and muſcular, who had his humeral artery wounded in opening the baſilic vein. The blood flowed in great quantity, and, per ſaltum, was ſtopped by ſtrong compreſſion.

tione prævios, *pulſatio pariter in totum evanuiſſet*, quum in priori aneuriſmate uſque ad omnimodam ſanationem cum durities, tum quoque pulſatio jugiter perduraſſent. Duobos vero poſt ægrotantis e noſocomio diſceſſum elapſis menſibus, quum illum accerſiviſſem, ut eumdem rurſus inſpicerem, nil aliud in ejus poplite deprehendi, niſi parvam duritiem, quæ caſtaneæ figuram, ac magnitudinem habens, exoſtoſim mentiebatur, atque ipſe Damianus per paululum tunc temporis claudicabat." * Medical Tracts, Vol. II.

Firſt an ecchymoſis extended itſelf generally from the ſhoulder to the wriſt; then the aneuriſmal tumor formed, and in ſix months it had increaſed to the ſize of a cricket ball. The arm was oppreſſed, cold, ſhrunk, and, as the patient expreſſed it, painfully lifeleſs; he was adviſed to have the operation performed, but he firſt thought of conſulting Mr. Blagden.

Mr. Blagden found the aneuriſm of this great ſize, hard, with a ſtrong pulſation in it, but the fore arm below was cold and pulſeleſs. Now the patient had aſſured Mr. Blagden that the tumor had been larger, that it was ſubſiding, that the pulſe in it was ſomewhat abated; and Mr. Blagden did not ſcruple to adviſe, that he ſhould wait the iſſue of theſe changes, rub the arm with the fleſh-bruſh, and refrain from exertions.

In a few weeks the arm grew a little warmer; in about three months he began to be ſenſible of a tremulous pulſe at the wriſt; the tumor gradually diminiſhed, and the ſtrength of the pulſe at the wriſt increaſed; in eight or ten months the tumor in the bend of the arm was reduced to the ſize of a hazel nut, while the pulſe at the wriſt was quite reſtored, and the arm as full and fleſhy, as capable of as powerful exertions, as the ſound one, but he was deſired to avoid ſuch exertions.

The author concludes with this ſentence: "It is too evident to admit of any doubt, that the circulation is carried on in its uſual courſe through the artery, and not through the lateral anaſtomoſing branches of it *."

I am well aſſured, that in this caſe the blood paſſed only through the anaſtomoſing branches; the profunda and ramus anaſtomoticus were enlarged, the trunk obliterated, the circulation along the fore part of the arm gradually ſubſided in proportion as the veſſels upon the back part enlarged; and I found my opinion upon certain expreſſions of the author, very clear I think and intelligible, and which I ſhall preſently quote.

When an aneuriſm grows to ſo uncommon a ſize as this, it is implied that the artery is largely wounded, but ſtill, being ſupported by clots and by the reſiſtance of ſurrounding parts, it tranſmits a tolerable proportion of blood. When the aneuriſm arrives at the ſize of a cricket ball, the diſeaſe muſt take a turn; the forces of the pulſating artery and of the tenſe aneuriſm lying over it are nearly balanced, and either the force of the artery muſt overcome the reſiſtance of the ſurrounding parts, and the aneuriſm burſt, or the reſiſtance of the parts muſt ſuppreſs the action of the artery, and then the inoſculations muſt enlarge. If the artery be largely wounded, it will throw out much blood, it will form

* Vol. II. page 50.

a very large tumor, but it will not have force to puſh that tumor beyond a certain extent. The artery thus wounded being little able to tranſmit blood for the nouriſhment of the arm, the inoſculating arteries will enlarge, the impetus of the main artery paſſing under the tumor will be gradually leſſened, while the reſiſtance of the tumor will be ſtill the ſame, the clots will become firmer by the abſorption of the thinner parts, and the cellular ſubſtance will become thicker by ſucceſſive inflammations. The faſcia in the bend of the arm, naturally ſtrong, will now be greatly thickened; the reſiſtance of the tumor and the action of the artery being thus balanced, the one will ſoon overcome the other, the pulſation in the aneuriſm will flag, the courſe of the blood through it will relent, the arm below will be for a time cold and powerleſs, and as the blood does not pour, as before, into the aneuriſmal ſac, the ſize of the aneuriſm will begin to diminiſh almoſt as ſoon as the pulſation of it ſubſides; then the collateral arteries will enlarge, and the ſpontaneous cure thus begun will end in the total obliteration of the main artery; the recovery of heat in the lower part of the arm, and the pulſe (fluttering and hardly ſenſible at firſt) will be ſlowly re-eſtabliſhed.

Thoſe various ſteps of the proceſs are perfectly marked in Mr. Blagden's relation of the caſe. Firſt, When he ſaw the aneuriſm, it was large as a cricket ball, the arm below was oppreſſed, it was "painfully lifeleſs," there was no pulſe in the wriſt, and the tumor was beginning to decreaſe in ſize! The forces at that period were divided, and the inoſculations were beginning to enlarge. Secondly, Within a few weeks the arm grew warmer, he could perceive a tremulous kind of motion at the wriſt, the tumor very gradually diminiſhed, the pulſe in the tumor grew weaker, and the motion at the wriſt ſtrengthened in proportion as that at the bend of the arm ſubſided! Is this the way in which the pulſe of the wriſt ſhould ſtrengthen, if the blood by which that part of the artery was filled, was conveyed by the main artery through the bend of the arm under the tumor? Laſtly, "The tumor grew hard as it diminiſhed in ſize; when reduced to the ſize of an apple, it was perfectly incompreſſible; it was thought to have become perfectly ſtationary, but in the courſe of eight months, it was reduced to the ſize of a hazle nut, and loſt much of its hardneſs." This is juſt the deſcription of an obliterated artery. In this paſſage not one word is ſaid of pulſation in this remaining tumor, nor of the free action of the artery lying under it in the bend of the arm! In a tall and muſcular man, ſuch as this was, I think I could undertake, after this ſpontaneous cure, to point out the ramus anaſtomoticus in its enlarged ſtate turning under the inner condyle of the os humeri.

Let us now attend to the effects of our ligature, not upon the artery which it intercepts and cuts acroſs, but upon the tide of blood which it diverts to the other arteries of the limb. When we operate with ligature on the artery of the thigh, we can mark the very inſtant in which the artery is obſtructed; we perceive, after a momentary coldneſs and deadneſs of the limb, a renewed action of its veſſels and increaſed heat. We find the limb cold when its blood is for a moment obſtructed; we find its heat riſing far above the natural pitch, while as yet there is no pulſe in the great arteries of the lower part of the limb, for at this time all the ſmaller arteries of the limb are enlarged and acting very powerfully. The ſmaller arteries perform for a certain term the office of tranſmitting blood; but when one artery takes the lead, and acts with ſuch power as to become the direct trunk for all the arteries of the lower part of the limb, then the general vaſcular action of the limb ſubſides, the blood is drawn into one or two channels, the veſſels in general reſume a natural and quiet action, and the heat, which had riſen 6 or 8 degrees above the natural temperature, falls to 96. If this be the true account of what is paſſing in an aneuriſmal limb, we ſhould be able to demonſtrate the fact.

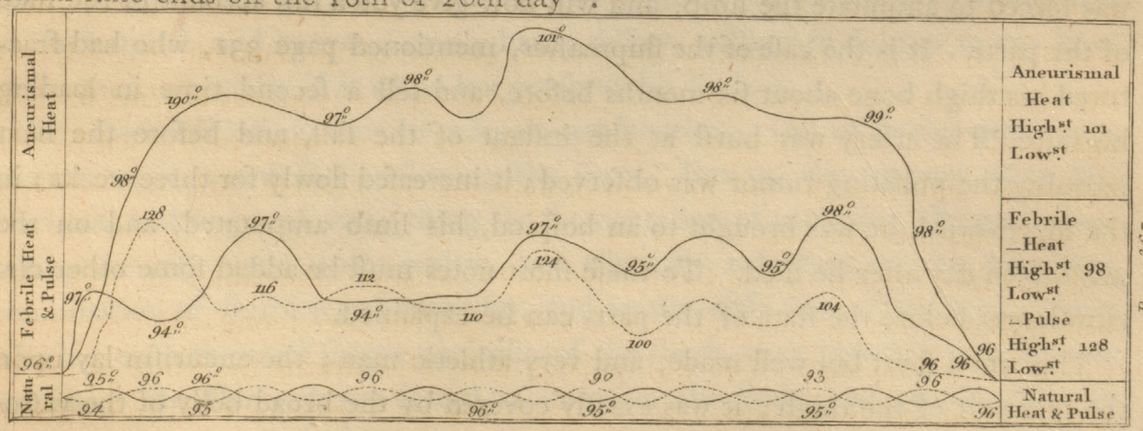
I take this riſing of the animal heat in a limb to be the ſureſt teſt of the action of its arteries; and the caſes by which I would prove this important fact are of the moſt unexceptionable nature, they are three in number, they are caſes in which the aneuriſmal ſac was not touched by the ſurgeon, in which the artery was tied on the fore part of the thigh; this change of the current of the blood, this ſubſtitution of the collateral arteries for the great trunk, was effected in thoſe operations in the moſt ſimple manner. The operations were performed by Mr. Forreſter, and from the firſt moment of applying the ligature, Mr. Babington of Guy's * meaſured the heat twice a-day.

I ſhall now preſent to you (with ſome ſlight variation) the tables of heat; you will judge whether the phenomena which they preſent correſpond with the changes which I have ſuppoſed. You will remark, firſt, That during the whole of the feveriſh period, while the limb was inflamed, the pulſe roſe to 100, and often to 128. Secondly, That the general temperature of the body, as meaſured *by applying the thermometer to the arm*, roſe with the pulſe, but the increaſe is ſlight, the variation extending only from 68 to 72. Thirdly, You will remark, as you run your eye along this table, that the ſound leg is little affected by the occa-

* Dr. Babington, lecturer on chemiſtry at Guy's Hoſpital, is well known for his acute abilities and amiable manners. I ſhould think myſelf ungrateful, were I to neglect any opportunity of acknowledging the pleaſure and inſtruction I have had from his converſation.

ſional riſings of the pulſe. By applying the thermometer *to the ſound thigh*, the heat was found uſually to be at 96 or under, ſeldom falling below 89, or riſing higher than 98.

But you will, laſt of all, obſerve, that the aneuriſmal limb which has ſuffered the operation, and whoſe main artery has been tied, is not deprived of circulation, as has been repreſented, nor cold, nor apt to fall into direct gangrene; its circulation is intenſe! if diſpoſed to gangrene, it muſt be to that gangrene which ariſes from exceſſive action! The heat of the limb *whoſe artery has been tied riſes* on the day of the operation to 98; its temperature never, during the ſixteen days of fever, falls below 97. This unnatural heat often riſes to 101. This limb always preſerves a degree of heat exceeding that of the ſound limb by ſeveral degrees. One day we find it fall ſo low as to 94; but probably that aroſe from the cold ſtage of ſome febrile attack, for the heat of the body in general fell on that day to 68; and on the following day the pulſe roſe to 124, the natural heat of the arm to 72, and the heat of the diſeaſed limb to 101; and on the ſame day the ligature came away. On the 16th day from the operation the natural pulſe is reſtored; the fever goes off; the pulſe is 95; the heat of the ſound limb is natural, it is 96; the heat of the aneuriſmal limb deſcends to meet it, and is alſo 96; the heat of the aneuriſmal limb then becomes natural, and the aneuriſmal ſtate ends on the 16th or 20th day *.




In this plan † are repreſented, by waving lines, 1ſt, The natural movement of this man's pulſe about 95, and the natural heat of his thigh, as marked by the

* In the ſecond operation performed by Mr. J. Hunter, it would appear, that after having become 5 degrees hotter than the ſound limb, the aneuriſmal limb had recovered its natural temperature by the 4th day. *Vide* Medical and Surgical Tranſactions, p. 159.

† My friend, Mr. Kite of Graveſend, could have contrived to repreſent this very neatly. Perhaps nothing can be more ingenious, curious, or uſeful, than his Meteorological Tables.

thermometer, varying very little from 96. 2dly, There is repreſented, by a ſecond line of figures, the riſing of the pulſe immediately after the operation; and there accompanies this elevation of the pulſe a waved line, repreſenting the febrile heat of the ſound thigh, varying according to the movements of the pulſe, and riſing ſometimes to 98. It will be obſerved, that the heat of this the ſound limb is often below 96, that limb being generally cold through the whole progreſs of the diſeaſe. 3dly, The higheſt waving line, marked with the degrees of heat, ſhows how much more the limb which had ſuffered the operation was affected by this febrile ſtate; and the waved line, and the degrees marked upon it, indicate the aneuriſmal heat of the limb riſing ſometimes very high, to 101, and always keeping above that of the ſound limb.

But if this increaſe of heat proceed really from the change in the ſtate of the veſſels, ſhould we not find proofs of it in the increaſed diameter of its arteries? and ſo we do. The ſmalleſt arteries are enlarged to an important ſize; the number of apparent arteries, ſuch, I mean, as the ſurgeon has to ſtop with the ligature in his operations, is aſtoniſhingly increaſed in an aneuriſmal limb; and I enter upon this part of the proof with pleaſure, becauſe the moſt important concluſions ariſe from the conſideration of the fact.

I promiſed to return to that caſe of aneuriſm in which my friend Mr. Harkneſs was forced to amputate the limb, and will now give you a full account of the ſtate of the parts. It is the caſe of the ſhipmaſter, mentioned page 331, who had fractured his thigh bone about ſix months before, and fell a ſecond time in loading his ſhip. The artery was burſt at the inſtant of the fall, and before the next morning the pulſating tumor was obſerved; it increaſed ſlowly for three weeks; in the fourth week he was brought to an hoſpital, his limb amputated, and on the 4th or 5th day after he died. To theſe ſhort notes muſt be added ſome other circumſtances before the ſtate of the parts can be explained.

This was a ſhort but well made, and very athletic man; the aneuriſm lay upon the fore part of the thigh; it was exactly covered by the broad belly of the vaſtus internus muſcle, but it did not at all oppreſs the ham, otherwiſe than by preſſing the tendons of the inner ham-ſtrings backwards very ſtrongly, for the aneuriſm lay entirely above the paſſage through the triceps. The aneuriſm ſeemed exceedingly large, becauſe it heaved up the muſcles, and was alſo covered with integuments greatly thickened by inflammation, for the limb was naturally very groſs, the man was fat, the muſcles very plump, the ſkin well provided with cellular ſubſtance, and not yet thinned by extenſion, but only ſlightly inflamed. From theſe cauſes

the tumor ſeemed very large and diffuſed, almoſt covering the knee joint, whereas, upon diſſection, the real aneuriſm was found to be fairly circumſcribed, ſaculated and ſmall, holding but about a pound and a half of blood. Its throbbing was of a very alarming kind, not becauſe the pulſation was ſtrong and diſtinct, but deep, heavy, and what the French term *ſourd*. The pulſe moved rather the whole ſubſtance of a very fleſhy thigh, than any particular tumor.

The tumor increaſed very ſlowly, conſidering the ſize of this artery, for the great femoral artery was cut almoſt entirely acroſs. There was no poſſibility of blood paſſing to the limb through the main artery, the inoſculating arteries were of courſe in full play; they ſuſtained the limb for three weeks, and their action of courſe drew off the tide of blood from the main artery; its aneuriſm was growing very ſlowly, and its pulſation was rather leſs terrible than it had been.

The ſwelling was moſt prominent about two hands-breadth above the knee, its centre was over the place where the artery paſſes through the triceps muſcle, it was there that the patient felt the firſt pulſation, it was to that part that he pointed as the ſeat of his chief pain, and it was juſt under that point that we found the artery wounded or lacerated by the broken bones.

This was not indeed one of theſe caſes where one might ſay the patient had not many days to live, but yet it was a caſe inevitably fatal! operation was unavoidable! it was for the purpoſe of having the operation performed that he was laid in the hoſpital, and he was a manly hardy fellow, willing to ſubmit to any kind of ſurgery, eſpecially if it could but preſerve his limb.

Mr. Harkneſs loſt no time in calling a conſultation. Out of twelve gentlemen preſent, eight voted for preſerving the limb. But on the morrow when Mr. Harkneſs had prepared every thing for the operation of aneuriſm, the gentlemen taking the caſe again under review, and eſpecially reflecting on the dangerous combination of fracture and aneuriſm, and on the difficulty of ſaving a perſon who has even the moſt ſimple aneuriſm of the thigh, they reverſed their former opinion. Mr. Harkneſs was forced to amputate the limb, and on the fifth or ſixth day the man died of gangrene.

The diſſection of this limb explains particularly well, the condition of a deep ſeated aneuriſm occaſioned by a fractured bone, it explains alſo matters of much higher importance, and eſpecially it demonſtrates the danger of amputation, and the eaſe with which the artery, in ſuch circumſtances, may be found and tied.

Of this diſſection, there are three ſlight etchings, and a more finiſhed drawing.

Figure 1ſt ſhows the outſide appearance of the limb; the ſkin is diſſected away; the faſcia alſo which formed the external covering of the tumor, which was exceedingly thick and firm, and deſcended very ſtrong over the gaſtrocnæmii muſcles, is diſſected off. Under the faſcia lie the muſcles, and now it will be underſtood how deep ſuch an aneuriſm lies, how entirely it is covered by the largeſt muſcles of the limb; let it be noticed, that the aneuriſmal ſac lies under the thickened ſkin, the œdematous cellular ſubſtance, and theſe thick muſcles of the thigh, then it will be eaſily underſtood why in conſultation the aneuriſm, though in itſelf ſmall, round, and regularly circumſcribed, ſeems ſo large and ſo diffuſed. Of theſe muſcles (a a), marks the Vaſtus Internus, and the aneuriſm lies right under it, the fibres of the muſcles being extended over the tumor almoſt to parting; the muſcle is connected with the proper aneuriſmal tumor only by cellular ſubſtance; and at (b), the muſcle is cut, its cut edges left abrupt, and the aneuriſmal ſac (b) is ſeen protruding. The ſartorius (c), the gracilis (d), the ſemitendinoſus (e), the ſemimembranoſus (f), thoſe muſcles whoſe tendons conſtitute the inner ham-ſtring, lie along the inſide of the tumor. The fleſh of the vaſtus externus (g) is ſeen on the other ſide of the thigh where it was cut in amputation, and the biceps cruris where its ſecond head comes off from the linea aſpera at the back part of the thigh bone is alſo ſeen at (h), as cut acroſs by the amputation knife. (i) is the belly of the gaſtrocnæmius, and (k) is the ſkin turned down.

Figure 2d ſhows thoſe muſcles laid aſide in order to ſhow the proper aneuriſm, where (a) marks the broken extremity of the thigh bone, (b) the ſemimembranoſus, (c) the tendon of the ſemitendinoſus which forms the ham-ſtring of the inner ſide, (d) the biceps which goes to form the ham-ſtring of the outer ſide, (e) the heads of the gaſtrocnæmii muſcles lying betwixt the two ham-ſtrings. But the parts which particularly relate to the aneuriſm are theſe, the vaſtus internus (f) which was expanded over the aneuriſmal ſac, is here cut and laid aſide to ſhow the ſac. (g) is the triceps magnus, where it is juſt going to be fixed to the linea aſpera of the thigh bone, and (h) is its tendon ending in the condyle. (i) is the aneuriſmal bag now plainly ſeen to be independent of thoſe external coverings of the tumor. It may now be perceived that the aneuriſmal ſac belongs chiefly to the perioſteum, and to the cellular ſubſtance which lies round the bone and under the muſcles. (k) marks the femoral artery and vein, about two inches above the place where they paſs through the triceps muſcle, betwixt it and the thigh bone, and (l) marks the ſame artery and vein,

Slight Etchings of the Aneurism of the Thigh
Described page 370.

Fig. 3.

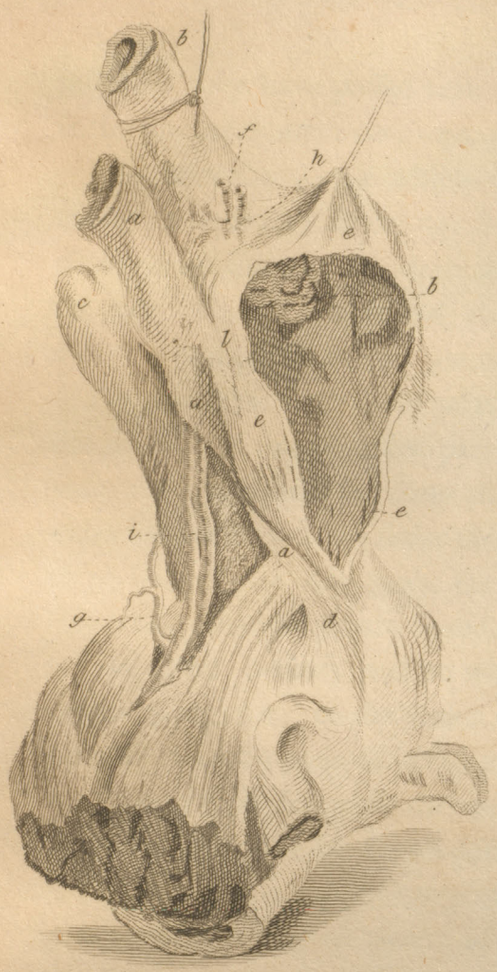



Fig. 2.

Fig. 5. p. 345.

Fig. 4.

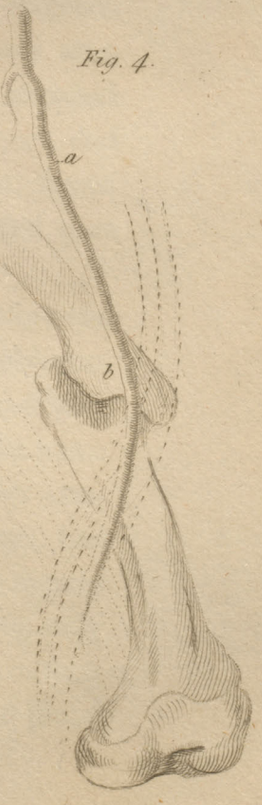
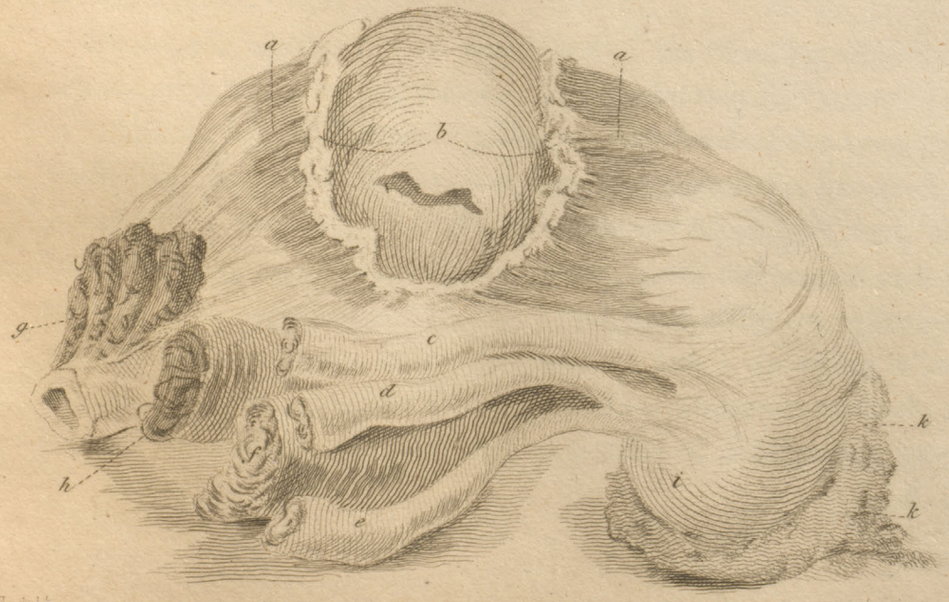



Fig. 1.




J. Bell. del.

D. Lizars. Sculp.

juſt after they have paſſed through the triceps and entered into the ham, and (m) is the popliteal nerve accompanying the artery and vein.

The aneuriſmal ſac which forms the moſt important figure in this ſketch, though exceedingly firm, was ſo tranſparent, that when the vaſtus internus was diſſected off from it, the dark blood was ſeen through it giving a purple tinge to the ſac. The ſac was round, about the ſize of three fiſts, and might contain from a pound and a half to two pounds of blood, partly fluid and partly coagulated.

Figure 3d preſents thoſe parts in a new poſture; the aneuriſmal ſac is ſlit up, the ſound and the wounded parts of the artery are ſeen at once, (a) the triceps divides the aneuriſmal ſac from the ham, for it is the tendon of this muſcle that divides naturally the fore from the back part of the thigh. The triceps adheres to the thigh bone in the line (a a), the aneuriſm is all before the triceps, while the veſſels behind the triceps are ſound. (b) is the upper broken end of the thigh bone, (c) the lower broken end to which the triceps adheres, (d) the tendon of the triceps going down to the inner condyle, the letters (e e e) mark the aneuriſmal ſac plainly continuous with the perioſteum, it conſiſts of the cellular ſubſtance immediately connected with the perioſteum, thickened, ſmooth, firm, and cartilaginous. (f) marks the ſound part of the artery where it has paſſed through the triceps taking the name of popliteal, (g) is one of the articular arteries ſingularly enlarged, as they all were; it muſt indeed ſeem remarkable that theſe arteries ſhould appear ſo well filled with injection, ſince I could not venture to inject them till after much of the diſſection was performed. (h) marks the artery and vein where they approach the ſac, (i) marks their emerging in the ham, ſound and natural, (l) marks the corner of the ſac under which lies the wounded part of the artery.

Figure 4th repreſents the idea I had of the breaking of this artery before the leg was ordered to be amputated. I imagined that the artery (a) paſſed obliquely acroſs the hollow formed by the fractured end of the bone (b), and had been preſſed by the muſcles ſartorius and gracilis, againſt the ſhattered end of the bone. I ſuppoſed it probable that when the patient ſlipped his foot, the muſcles contracting ſtrongly, and bending the artery acroſs the ragged end of the bone, had fairly broken the artery acroſs; but I find, upon diſſection, that the artery is merely wounded, the wound is indeed half an inch long; the artery is left hanging only by a tag, no more than the fourth part of its circumference; the artery is in ſuch a condition, that it muſt have been incapable of tranſmitting one drop of blood

for the nouriſhment of the limb, which, even from the moment of the fall, muſt have depended upon the collateral arteries. This is the great concluſive fact which makes all the phenomena of this caſe peculiarly important *.

That enlarged and active ſtate of the whole muſcular ſyſtem of the limb, which I have hitherto proved by inference only, was demonſtrated in this caſe; for the main artery was incapable of tranſmitting one drop of blood; the popliteal artery notwithſtanding retained its full ſize; it retained its full ſize becauſe of the number of enlarged inoſculating arteries which opened into it; and thoſe inoſculating arteries which thus ſupported and filled the popliteal arteries, were the branches of the profunda; when the thigh was amputated, Mr. Harkneſs had to tie no leſs than fourteen arteries, every muſcular branch bleeding like a trunk.

## CONCLUSIONS.

Thus we ſee, that when a great artery is diſeaſed or wounded, and an aneuriſm formed, there is no cure but that of the entire obliteration of that artery; and by whichever method we accompliſh the cure, obliteration is invariably the effect.

Whatever phyſicians may have believed of their ponton, or bridge-like compreſs, affecting, as they ſuppoſed, the tumor only, and yet allowing the blood to paſs along the artery; whatever they may have believed of their well-contrived ſprings and cuſhions for partial preſſure; whatever the old ſurgeons may have attributed to thoſe ſponges, vitriol-buttons, pellets of chewed paper, or morſels of agaric, which, after cutting open the aneuriſm they applied to the wounded artery; in truth, they cured by compreſſing, deſtroying, cauteriſing it, and, one way or other, obliterating its canal; and I have juſt proved, that whatever the celebrated Guattani believed concerning the effects of his bleeding, ſpare diet, confinement, and well-ſupported compreſſion, yet, in fact, he alſo obliterated each artery; and we may now take a ſlight review of the phenomena which preſent themſelves according to the various ways in which this proceſs of obliteration is effected.

Firſt, If we tie the main artery of a limb, its blood being ſuddenly interrupted, the limb is cold for a moment, but its heat and circulation ſoon riſe above

* The tinted drawing gives a true idea of the ſtate of the aneuriſmal ſac, &c. It is taken from the preparation. It has the colours of a preparation ſoaked in ſpirits. The parts will eaſily be underſtood, by comparing it with theſe plans; and in this drawing the preparation is ſo turned, that the laceration of the artery is ſeen diſtinctly.

Drawing of Mr Harknesses
Case of Aneurism

p.372

moral Vein
moral Artery
ore entering into
e Sac
moral Artery lacerated
ing in the Center of the Sac
plitial Artery & Vein coming
t of the Sac & imbeded in the Cellular
bstance of the Ham

5. Ragged end of the Bone by which the Artery was lacerated
6. The Aneurismal Sac coming off from the Periosteum
7. the Condyle of the Thigh Bone
8. Patella 9. Mucous Ligament
10. Semimembranosus 11 Semitendinosus
12. Gastrocnemii

J. Bell delin.

the natural ſtandard. The blood no longer paſſing along the main artery forces the collateral arteries; theſe are excited to a high action, the limb becomes turgid, the animal heat riſes high above the natural ſtandard, and the limb continues for ſome days in danger of gangrene from intenſe circulation; but never does it approach in the leaſt to that dry and cold gangrene from want of blood, which has always been ſo much feared! which has been, to the great loſs of ſociety, repreſented as the ſure conſequence of interrupting the main artery of a limb.

Secondly, When we compreſs an aneuriſm, the tumor itſelf is forced back upon the artery, the action of the main artery is ſuppreſſed, while the collateral branches are forced to receive its blood. When occaſionally we intermit the compreſſion, the blood returns to its old channels and the pulſation of the aneuriſm is renewed; but, by perſevering in the compreſſion, that channel is quite obliterated, and the cure is accompliſhed when the pulſation ceaſes on the fore part of the limb. Now, if this manner of obliterating the artery be not accompanied with the ſame interval of coldneſs and deadneſs of the limb that we are ſenſible of in uſing the ligature; if the ſame perceptible heat, turgeſcence of the limb, and high action of all its veſſels do not ſucceed, it is becauſe the tide of blood is more ſlowly turned, the collaterals ſlowly enlarged, and the courſe of the blood along the old channels is occaſionally reſtored, in conſequence of intermitting the compreſſion at times, which happens rather from the accidental ſlackneſs of the rollers than from any premeditated deſign.

If this cure by compreſſion be more ſucceſsful in the aneuriſm of the ham, it is by the firm reſiſtance of the bone againſt which the artery is compreſſed. If compreſſion fails, and is ſometimes dangerous in the thigh, it is becauſe the bone is too deep to give full effect to compreſſion, and the parts ſo ſoft that they allow the aneuriſm to ſpread in all directions; for in ſuch caſes, compreſſion, inſtead of ſtopping the blood in the artery, rather diffuſes the aneuriſm, forces the cellular ſubſtance, and inflames the parts.

Thirdly, When the cure is ſpontaneous, the proceſs is ſtill the ſame, and the proofs of the obliteration of the artery are as ſenſible as if we had accompliſhed it by ligature or compreſſion. The dilating force of the artery and the reſiſtance of the ſurrounding parts of the muſcles, or of the faſcia (for every artery lies under faſcia) are balanced; the accumulation of the blood and the elaſticity of the faſcia begin to oppoſe the pulſation of the artery at the very moment when ſome proportion of the blood begins to be thrown upon the collateral arteries. The re-

ſiſtance of the tumor is increaſing, while the force of the artery is diminiſhing. If before this balance of the reſiſting and dilating powers be complete, and the aneuriſm burſt, then the man is gone, he dies of hæmorrhagy; but if the balance be fairly turned in favour of the circulation (through the collateral veſſels) along the back part of the limb before the tumor burſts, then the tumor burſts without hæmorrhagy; the arteries in all the lower part of the limb draw their blood through the collateral arteries, and the moſt indirect rout for the blood becomes the natural one. This ſpontaneous cure alſo is perfect only when the pulſation of the aneuriſm of the great artery on the fore part of the limb ceaſes, and the pulſation being gone, the abſorbents perform their office, the limb returns ſlowly to its uſual form. This cure is alſo marked by a firm tumor, which is the reſiduum of the aneuriſmal ſac, and a knotty and cord-like hardneſs, which marks the place of the obliterated artery.

The enlargement of the collateral arteries is the leading point then in every cure. From the very commencement of aneuriſm the circulation through the main artery is in ſome degree prevented. That difficulty increaſes daily, and ſo perfectly is the limb prepared for a change of circulation, that cut it off at what period of the diſeaſe you will, the number of arteries will ſurpriſe you. In this operation by Mr. Harkneſs, fourteen arteries were tied with the needle; and in an amputation performed by Mr. Allanſon *, you will find that there had been even a degree of confuſion from the number of arteries. "The large artery was taken up (ſays Mr. Allanſon) without including the nerve; but this could not be done in all the others, which were numerous, for it was neceſſary to tie nine arteries."

What then is the condition of an aneuriſmal limb? is it in danger of wanting circulation? is it in danger of gangrene from want of blood? quite the reverſe; all its veſſels are enlarged, while one only, viz. the great trunk is deſtroyed or oppreſſed; the blood of the main artery is divided among innumerable ſmall branches; the whole limb is turgid, throbbing with the intenſe action of theſe ſmaller arteries, now highly excited to work for the preſervation of the limb; if, during this turgeſcence, this febrile ſtate of the limb, you tie the main artery, the heat will immediately riſe many degrees above the natural ſtandard;

* P. 262. This was an aneuriſm of the ham, which was occaſioned by a fall from his horſe in a young gentleman of a pale and ſickly habit. He ſprained his knee in falling; the aneuriſm had grown about four months, and was now beating ſtrongly as if it would burſt, and it was beginning to be diffuſed up the thigh.

above the temperature of the ſound limb; if you cut off the limb thoſe arteries will bleed from every point of the amputated ſtump. This limb is not cold; does not need to be wrapped in flannels, nor rubbed with eſſential oils to ſolicit blood towards it; its veſſels are in no danger of being forſaken, but rather of being oppreſſed with blood; the limb is indeed diſpoſed to gangrene, but not of the paſſive kind! If you perform the operation of aneuriſm, the wound you make will often fall into gangrene, but never without previous inflammation; if you venture to amputate the limb you are ſtill in danger of gangrene, it ſeizes upon the ſtump, but never without previous ſwelling, nor does the gangrene happen till the fifth or ſixth day.

There is nothing more certain than that this aneuriſmal ſtate of a limb prediſpoſes to every danger, and it becomes us to look well to the facts and reaſoning by which ſuch a doctrine is eſtabliſhed, for its influence over practice cannot be ſlight.

### OF THE DANGER OF AMPUTATING AN ANEURISMAL LIMB.

The danger of amputating an aneuriſmal limb is familiarly mentioned in every book, yet amputation appears ſo much like giving the patient a chance for life, and the operation for aneuriſm is in itſelf ſo dangerous, that amputation is too often preferred.

When the celebrated Guattani was induced to try compreſſion, it was becauſe he was ſenſible that there were certain circumſtances which would not allow of the operation for aneuriſm; and he was particularly ſtruck with the danger of amputation. "There were four caſes," ſays Guattani, "of immenſe aneuriſms in the ham in which I did venture to perform amputation; but though the temperament, age, and ſtrength of theſe patients, promiſed the happieſt iſſue, they all died. Two were taken with convulſions, which beginning, as uſual, in the jaw, extended down the back over the whole body; while two others died of hæmorrhagy, which came on the ſecond day after amputation *." This hæmorrhagy of which Guat-

"* Quod attinet ad amputationem, quatuor huc uſque fuerunt amputationes femoris, quarum data occaſione ingentium poplitis aneuryſmatum ego periculum facere non dubitavi, ſed omnes infelicem exitum habuere, licet temperamentum, ætas, ſatiſque validæ ægrotantium vires mihi omnia fauſta pollicerentur. Ex quatuor hiſce ægrotantibus duo deceſſerunt, etiamſi optime ſe haberet ulcus, ſuperveniente die ſeptima ſupra decimam uni, alteri vero die ſeptima atque vigeſima inopinato, funeſtiſſimoque ſymptomate convulſionis, quæ ab inferiori, ut jugiter conſuevit, mandibula initium capiens, et ad collum deinde, ad dorſum, ad pectus, univerſumque truncum porrecta, ægrotantes hoſce, ſpiritu intercluſo, peremit."

tani's patients died is juſt the commencement of that gangrene which I aſcribe to the peculiar condition of an aneuriſmal limb, " for the hæmorrhagy came on (ſays Guattani) on the ſecond, when the fever uſually commences;" and though it ſtopped, yet it came on again next night in great profuſion, and the patients died. He further remarks, and he laments it, " that after the death of the firſt patient, and when the hæmorrhagy returned in the ſecond, he was ſo anxious as to lift the dreſſings from the face of the ſtump. He ſeems to have been ſtruck with peculiar horror when he ſaw no one particular artery bleeding from the face of the ſtump, but every ligature firm. He replaced the dreſſings, and had little doubt of his patient being ſafe, but in the following night the hæmorrhagy returned, and this patient alſo died on the third day †." This general oozing from the face of the ſtump is juſt the beginning of that gangrene under which ſuch patients always expire.

The reſult of Guattani's reflections on this ſubject is delivered nearly in theſe words: " Since there are certain circumſtances in the condition of an aneuriſmal limb very unfavourable to operation, ſince we find that thoſe who ſubmit to have their limbs amputated die, ſince we ſee that ſometimes aneuriſm of the ham is ſpontaneouſly cured, we ſhould be reſolute, whenever the circumſtances are unfavourable to operation, to leave the affair to nature; at all events, it muſt be concluded from theſe caſes (ſays Guattani), that amputation is no means of ſaving the patient ‡."

Let us compare this with any other gangrene. What is it that diſpoſes a limb which has ſuffered a compound fracture to run into gangrene? If the ancle joint, for example, be luxated and fractured, the injured parts run into violent action, the blood is worked towards the inflamed part by the excitement of the veſſels, and the whole limb becomes turgid and highly excited. If, after this inflammation be come on, you venture to amputate the limb; if you add another wound to this prediſpoſition, you drive on the parts, already highly excited, to intenſe inflammation and gan-

" Duos reliquos interfecit aliud æque mortiferum, ac frequentiſſimum ſymptoma, nimirum hæmorrhagia. Hæc enim nocte operationi ſuccedente, *qua febris ut plurimum excandeſcere ſolet*, utroſque invadens, illos quidem poſtea dimiſit; ſed nocte proxima iterum eoſdem adorta ita illorum vires attrivit, ut, exeunte die tertio, animam uterque exhalaverit."

" † Verum mirifice obſtupui, cum firmas, immobileſque ſingulas vaſorum cernens vincturas, ac ne minimam quidem inde emanantem cruoris guttam conſpiciens, nil aliud mihi reliquum eſſe cognovi, quam modo ademptum priſtinum apparatum inſtaurare."

" ‡ Ex quatuor tandem amputationibus hiſce ſatis efficere poſſe videor, eas præſidium illud non eſſe, a quo merito adduci in ſpem valeamus, illius ope nos ægrotantes ejuſmodi allevaturos."

grene! that condition which cauſed the actual gangrene in the lower parts of the limb, prediſpoſes to it in all the upper parts! To amputate ſuch a limb is to add wound to prediſpoſition; the muſcles appear dark-coloured in the moment of amputation; the veſſels which throw out blood, and require the needle, are almoſt as numerous as in an aneuriſmal limb; inflammation immediately ſeizes the ſtump, gangrene comes on the third or fourth day! when the ſtump ſloughs, the veſſels begin to bleed, the blood flows from the whole ſurface, and with the fever, gangrene, and loſs of blood, the patient expires on the fifth or ſixth day.

There is nothing with which the condition of an aneuriſmal limb may be more aptly compared than this prediſpoſition to gangrene. It ſignifies little whether, in a fractured limb, the lower parts be ſo injured that the inflammatory action of the parts ſolicits blood along the veſſels of that limb, and makes it ſwell; or whether, by the obſtruction of its main trunk, the blood is forced upon the ſmaller arteries, ſo as to bring the limb into what I have called the Aneuriſmal condition; inflammation and a prediſpoſition to gangrene are equally the conſequences of either ſtate; and this prediſpoſition to mortification in an aneuriſmal limb, is matter of common obſervation: ſurgeons have cut off too many aneuriſmal limbs to be ignorant of this danger; and, as Mr. Ford very properly obſerves *, "Amputation, in the caſe of aneuriſm, is not among the happieſt efforts of ſurgery." I ſurely do not affirm that every one will die who has his limb amputated for aneuriſm; a degree of danger is all that I maintain; and that the gangrene is not of a paſſive kind; that it ariſes from active inflammation.

If, in mortification of the lower parts of a fractured limb, we wait for the ſigns of ſeparation, we wait, in fact, till the turgid and active ſtate of prediſpoſition is over, and then amputation is ſafe; but if we amputate a limb turgid, inflamed, and in this ſtate of prediſpoſition, gangrene ſeizes the ſtump; and if we amputate during the turgid ſtate of an aneuriſmal limb, we run preciſely the ſame riſk of gangrene.

### OF THE DANGERS OF PERFORMING ANY KIND OF OPERATION ON AN ANEURISMAL LIMB.

If amputation be not among the happieſt efforts of ſurgery, the operation of *aneuriſm* is, in certain circumſtances, almoſt inevitably fatal. We have reaſon to believe, that in the common accident of compound fracture, it is the gorged and excited

* *Vide* A paper of Mr. Ford's in the London Medical Journal.

ſtate of the whole limb that prediſpoſes to gangrene; that while ſuch a ſtate of the limb prevails, gangrene will attack the ſtump, however high we may chooſe to amputate the limb. We are alſo ſatisfied, that a ſimilar affection takes place in the aneuriſmal limb; its veſſels are enlarged, gorged, and highly active, the limb ſwelled, and I do not know why we ſhould not ſay, inflamed. We are well aſſured by every kind of proof, that the inoſculating arteries of the limb are fully equal to the ſupplying of the limb with blood, yet the diſeaſe of aneuriſm is often fatal by convulſions, fever, burſting of the tumor, and irreſiſtible hæmorrhages. If left to itſelf, the limb ſeldom dies of gangrene. When gangrene ſeizes upon the ſtump, it is from adding a great wound to this ſtate of prediſpoſition, not ſurely from obſtruction of the great artery.

When we apply the ſame reaſoning to the operation of aneuriſm, we perceive, that here alſo we are adding a great wound to this prediſpoſition; nor can we be ſurpriſed if, in the moment of ſtopping by ligature the main trunk, and enlarging of courſe all the collateral arteries, if in the moment of throwing the limb into this ſtate of prediſpoſition, we make a large inciſion, and dig deep to get at the aneuriſm, the limb falls into gangrene! it would indeed be almoſt a miracle if ſuch limb ſhould eſcape. We are ſenſible that the gangrene, when it does come on, is of that kind which ſucceeds high inflammation, for the gangrene accompanies that increaſe of heat which follows the tying of the main artery. We are alſo ſenſible, that the gangrene comes on after the limb is ſafe in reſpect of its circulation; for once, when Guattani was performing the operation for aneuriſm in the ham, he found it difficult, on account of the confuſion of parts, to tie the lower ligature, the blood flowing impetuouſly from the lower artery, Guattani "takes occaſion to reprove thoſe who are careleſs of applying the lower ligature *; he blames himſelf too, and acknowledges, that in this caſe the blood which eſcaped from below unqueſtionably came round by the inoſculating branches to this ill tied part of the artery †." Yet this patient, after this abſolute proof of the enlarged ſtate of the inoſculating arteries, and of free circulation

* "Me pariter nequaquam præterit, quoſquam eſſe ex Chirurgiæ Profeſſoribus, qui ſuperius Arteriæ vinculum dumtaxat præcipiant, de inferiori nihil ſolliciti, putantes forſan in compreſſione ſatis præſidii eſſe ad profluentem ſanguinem cohibendum."

† "At turpiter hi profecto falluntur, non ſecus ac egomet in prædicto ægrotante deceptus ſum. Sanguis enim, quem ab inferiori vinculo prodiiſſe admonebam, extra omnem dubitationis aleam ille ipſe fuit, qui per furculos laterales ad male revinctam delatus erat arteriam." P. 118.

of blood in the limb, died on the ſecond day of irremediable gangrene *. In the Medical Eſſays †, we find a patient dying of aneuriſm, of whoſe ſituation we have this ſhort note: "That for *three days* every thing ſeemed to do well; that there was a kindly warmth of the foot, and no more fever than was to be expected from ſuch an operation. Then, on the fourth day, the patient began to ſink, the foot to feel cold; then a gangrene appeared *in the ſides of the wound*, and he expired on the ſixth day."

We now ſee that this gangrene which follows the tying of the artery in an aneuriſmal limb, comes on after the inoſculations are enlarged, and the free circulation of the blood eſtabliſhed, after the kindly warmth is reſtored, after the limb has ſurvived four or five days, and the gangrene begins, not in the great toe nor foot, but in the edges of the wound, where injury is added to prediſpoſition.

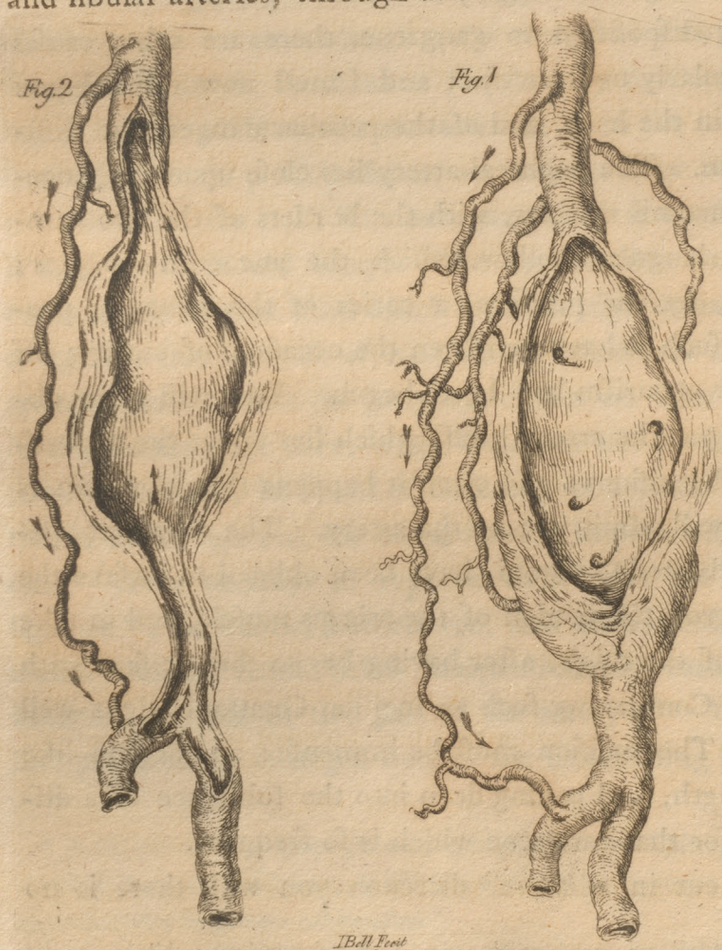
But beſides this general prediſpoſition to gangrene, there are other cauſes which make the operation ſingularly unſucceſsful; and I muſt now remind you of the frequency of aneuriſm in the ham, and of the peculiar dangers and difficulties of that kind of aneuriſm. The popliteal artery lies cloſe upon the knee-joint; the heads of the gaſtrocnæmii muſcles, with the borders of the two hamſtring muſcles, form a deep triangular hollow, which the aneuriſm occupies; there it is ſoon ſtraitened, and, by the preſſure, a caries of the bones is produced, ſuch as defies ſurgery, ſuch as has often been the occaſion of cutting off the limb after the operation for aneuriſm had been begun. You will next obſerve, that there is no getting at the artery itſelf, which lies under the aneuriſmal tumor, without the deepeſt inciſions; and often it happens that the ham is ſo diſordered, that no inciſion will admit you to the artery. The very beſt operators, as Mr. Pott and the celebrated Guattani, have been obliged to forſake the operation in the ham, to cut acroſs the tendon of the triceps muſcle, and to take up the artery on the fore part of the thigh, after having begun the inciſion with hopes of tying it in the ham. Concerning ſuch an inciſion Guattani might well ſay, Ex tam immani vulnere. The inciſion muſt be immenſe: an inciſion like this, of a foot and a half in length, and paſſing deep into the ſubſtance of a diſeaſed limb, may well account for that gangrene which is ſo frequent.

You will next obſerve, that cut in whatever direction you will, there is no

* "Poſtridie etſi torcular haud eſſet adſtrictum, gangrænam articulis minitabatur irreparabilem quæ die proximo ægrotantem de medio ſuſtulit."

† Page 220, Vol. III.

avoiding thoſe very arteries which after your operation ſhould ſupport the limb! You muſt go ſtraight forward! The tourniquet is ſcrewed, you ſee no arteries beating, nor indeed could you avoid them, for there is no part of this joint that is not ſurrounded with the moſt important branches; you muſt wound them; and very ſingular conſequences ariſe from the various accidents of theſe articular arteries. If, in a natural aneuriſm or mere dilatation of the popliteal artery, the ſac be cut open, theſe inoſculating arteries, whoſe mouths open upon the internal ſurface of the ſac, and belong originally to the dilated portion of the artery, as in Figure 1ſt, will bleed from uncertain parts of the ſac; or when the ſac is opened, though no ſuch arteries run into it, yet, by joining the artery below the ſac, as in Figure 2d, their blood comes by a retrograde courſe up from the tibial and fibular arteries, through the lower end of the artery. This is frequently the cauſe of ſecondary hæmorrhagy. Again, when the artery is tied on the fore part of the thigh, without any inciſion into the ſac, the pulſation, though it ſtop the inſtant the ligature is tied, may return the ſecond or third day, from the increaſing power of thoſe collateral arteries, which enlarge more and more from the moment of the operation, and ſoon acquire ſuch a ſize as to fill the aneuriſmal ſac; and when the ſac is thus filled, a number of ſmall arteries will give it a pulſatory motion, as if the ligature upon the main artery had given way! It was ſuch a pulſation that ſo alarmed Mr. Pott that he immediately cut off the limb: but this ſecondary pulſation is not a mark of danger; it is, on the contrary, a ſure token of ſucceſs. This retrograde blood



will be eaſily oppoſed by a ſlight compreſſion; and the inoſculating arteries thus filling the tumor again, is a ſure ſign that they are capable of nouriſhing the limb.

Laſtly, Theſe arteries thus circling in every direction round the tumor and round the joint, belonged originally to the ſurrounding parts; their branches ſtill (while performing the more important office of ſupporting the limb), nouriſh thoſe parts to which they originally belonged. Theſe branches cannot eſcape the knife; and the cutting of the ſmalleſt of their branches muſt empty thoſe inoſculating arteries, which ſhould ſerve as trunks to the limb. But, worſe than all, the articular arteries themſelves are cut in making way into the aneuriſm of the ham; the inciſions paſs through the muſcles and the muſcular branches; the needle, before it encloſes the popliteal artery, muſt be driven down to the bone! By the cutting of thoſe inoſculating arteries, blood wells out from all parts of this deep wound, and a hæmorrhagy comes on, which is not to be ſubdued but by thruſting down ſponges into the bottom of the cavity, and cramming it with lint. Thus the enlargement of thoſe inoſculating arteries, which we thus have conſidered as an ineſtimable advantage, conſtitutes the chief danger of the operation, the only one, indeed, which a good operator cannot eſcape. This is the kind of ſecondary hæmorrhagy ſo often mentioned, and ſo little underſtood; theſe are the arteries whoſe bleeding has forced the ſurgeon ſometimes (unable to command them) to cut off the limb; theſe are unqueſtionably the arteries which filled up the ſac again, and produced a new pulſation in that operation of Mr. Pott's, which has been ſo invidiouſly commented upon. Theſe very arteries which the ſurgeon wiſhes ſo anxiouſly to have enlarged, ſpoil his operation. If gangrene ever ariſes from want of blood, it muſt be rather from the cutting of thoſe articular arteries which ſhould ſave the limb, than from the interruption of the main artery, on which it no longer depends.

I wonder only that this operation for aneuriſm of the ham has ever ſucceeded. There is here repreſented ſuch a combination of circumſtances unfavourable to this operation, as to entitle the ſurgeon, when he does ſucceed to rank the cure, "among the ſucceſsful *efforts* of ſurgery."

### OF THE SAFETY WITH WHICH WE OPERATE ON THE FORE PART OF THE THIGH.

The operation propoſed by John Hunter, is one of the moſt important improvements in modern ſurgery, and one which only a great ſurgeon could

invent. The ſuperiority of this operation conſiſts not in eſcaping that part of the artery which is diſeaſed, for the yielding of the artery depends upon very different cauſes, and is to be prevented by precautions very different from this of changing the place of operation! I ſhall be able, indeed, to prove, that the artery of a young and healthy ſubject gives way almoſt as frequently as that of the aged or diſeaſed. But, in Mr. Hunter's operation, you imitate the natural and ſpontaneous cure; the limb is prepared for that change, which you mean to complete by your operation; the main artery is compreſſed by the aneuriſm; the collaterals are enlarging; nature has begun a proceſs with which it is dangerous to interfere, which you are to complete; you cannot with prudence make an inciſion into the diſeaſed maſs; you would not chooſe to cut the parts which are ſupplied with blood by thoſe very inoſculations which you wiſh to ſave. In Mr. Hunter's operation, you make an inciſion in the fore part of the thigh; there you tie the artery far above the aneuriſm; you ſtop the blood, and throw the whole circulation upon the inoſculating arteries; you but complete that proceſs which nature had begun, and leave the abſorption of the tumor to time.

You make this ſmall and ſuperficial inciſion (hardly three inches in length) upon the fore part of the thigh, above the part of the limb affected with aneuriſm, and of courſe you have no thickneſs of parts to cut through, except what ariſes from the general œdema of the limb. Your firſt inciſion is through the ſkin, your next is through the ſtrong faſcia of the thigh; you encounter no inoſculating arteries, you deprive the limb of no one blood-veſſel, except the great artery, which it is at any rate about to loſe, and which is already much compreſſed; you make no diſorder in the limb, you touch no diſeaſed part, you have no deep digging for the artery, you have no difficulty, no uncertainty in tying it, you run no riſk of ſecondary hæmorrhagy, at leaſt from the articular arteries; you make no inciſions among parts which are choked with extravaſation, where the muſcles themſelves ſeem hardly more alive than the coagulated blood which they contain; you expoſe no joint to ulceration, nor any bones to caries. Far from increaſing thoſe diſorders which are within the injured part, you rather take away the cauſe of diſorder, by preventing any further effuſion of blood. Your inciſion is ſmall, your way to the artery is direct; you feel your way by the pulſe of the artery, and are aſſiſted by your knowledge of the parts; if you be really an anatomiſt, you muſt perform this operation in a few minutes; if you be not, and

dare to undertake ſuch an operation, I know of no puniſhment too ſevere for ſuch unprincipled conduct; no human reproaches can touch a mind which does not feel the puniſhment within *.

## OF THE OPERATION OF TYING A GREAT ARTERY; WHY THE LIGATURES SO OFTEN GIVE WAY; AND HOW THE ARTERY WILL BE BEST SECURED.

We have now brought this ſubject nearly to its concluſion; but this laſt point is, indeed, the moſt intereſting, viz. the way of ſecuring the artery. We are aſſured that the limb is ſafe, in reſpect of the ſupply of blood; the collateral inoſculating arteries are enlarged; they are, from the firſt moment of the aneuriſm, in the habit of tranſmitting blood, and in part, at leaſt, of ſupplying the limb; and we return once more to this intereſting queſtion, "Why does the artery give way, for that alone is the cauſe of death? Why is there ſuch a difference in the ſecuring of an artery tied in aneuriſm, an operation ſo full of difficulty? and in amputation, an operation ſo perfectly ſafe, that the death of a patient would be a flagrant diſgrace?"

Mr. Home, in deſcribing the operation propoſed by Mr. Hunter, ſays, that "if we conſider the caſes in which the common operation for popliteal aneuriſm has been performed, and when the patients have died, we ſhall probably find, that in all of them the artery has been diſeaſed at the part encloſed by the ligature, and had either ſloughed off, or had been cut through where it was tied †," &c.

I am now to demonſtrate to you, that the yielding of the artery ariſes from no ſuch cauſe. I am now to recur to thoſe principles which I laid down in my firſt Diſcourſe on Aneuriſm, and am to prove what in a former diſcourſe I only affirmed, "That by inſulating the artery, tearing it up from its cellular ſubſtance, and keeping it for ten or fifteen days detached from all the ſurrounding parts, it can do nothing but gangrene below the ligature, and ulcerate and burſt above." Unleſs thoſe fatal hæmorrhages from burſting of the artery be owing to our manner of tying it, I know of no cauſe to which they can be aſcribed; you may, indeed, be aſſured, that there is ſomething faulty in our manner of tying the ar-

* I have known an operator grope for half an hour before he could get at the femoral artery in the found part of the thigh.

† *Vide* London Medical Journal. Thoſe notions of the pathology of a wounded artery are far from being the moſt correct. Every artery tied with ligatures muſt both "ſlough off and be cut through."

tery, and that its yielding does not proceed from diſeaſe! for in recent wounds, the artery is as apt to burſt as in caſes of old aneuriſm proceeding from natural dilatation; and it has given way as often when tied according to Mr. Hunter's method, on the fore part of the thigh (far from the ſeat of diſeaſe), as when tied in the cavity of the ham itſelf, after much painful diſſection. Having witneſſed the moſt terrible hæmorrhages in young people, and in recent wounds where I ſaw and fingered the femoral artery, I am well aſſured that diſeaſe is not the cauſe of its yielding; and having obſerved how ſeldom the artery gives way in an amputated ſtump, I think I dare affirm, that with good conduct and care we ſhould be able to command any artery.

I proceed, then, to analyze the ſeveral operations which have been performed upon the femoral or popliteal artery, and ſhall endeavour to prove, Firſt, That the more pains the ſurgeon takes in ſecuring the artery, the more does he inſulate the artery, deſtroy its vaſcular connection with the ſurrounding parts, and endanger ulceration and burſting. Secondly, That the oldeſt method of all, recommended by the Arabians, and practiſed even by modern ſurgeons, viz. the cutting the artery acroſs after it is tied, is in truth the only operation which can give to the artery tied in aneuriſm the ſecurity of an artery tied in amputation of the thigh. The firſt part of my duty, then, is to enumerate thoſe faults in the manner of tying the artery, from which ſo many have loſt their lives, and ſo many of the beſt ſurgeons have failed in their attempts to ſecure the femoral artery.

The Engliſh ſurgeons were among the firſt who attended to this important piece of ſurgery. Mr. Hunter ſuſpected, that a diſeaſed ſtate of the artery was the cauſe of its giving way; for this reaſon alone did he change the place of operation; but even when he tied the artery on the fore part of the thigh, far from the ſeat of diſeaſe, the artery gave way as frequently in his own practice as in the older way of operating.

This doctrine has univerſally prevailed, "That it would be better even to *prevent the wound healing* after the tying of the artery, and keep it open and in a ſtate of ſuppuration, by which means the operator would have it more *in his power to come at the artery, ſhould that be neceſſary;* he might alſo, in dreſſing this open wound, have it in his power, by gentle compreſſion, to aſſiſt the ligatures *." This is profeſſedly the principle of Mr. Home; and this moſt danger-

* See an Account of M. Hunter's Operations, by Mr. Home.

ous doctrine led directly to thoſe very precautions which, inſtead of enſuring the obliteration of the artery, cauſed its ulceration and burſting; for, as it was thought adviſable to lay compreſſes within the wound to ſupport the ligature, it became important to have a conſiderable length of the artery expoſed. The ſurgeon was too ſenſible, from experience, how apt this operation was to fail; and though he could not ſuppoſe that the laying much of the artery bare could contribute to its ſecurity, yet he wiſhed to have a command of it; he wiſhed to ſee it when it burſt, and to be able to draw his ligatures again, or to drive his needles under it a ſecond time, if neceſſary. Accordingly, he laid relays of ligatures under the artery, that it might never be out of his ſight, although, in truth, till the artery be out of ſight, buried among the fleſh, it can never be ſafe.

Another theory ſtill more ſubtle was this. The ligature, as ſome affirmed, ſhould not be drawn tight; it ſhould, ſay they, be ſtraitened in ſuch a degree only as to moderate the flow of blood through the artery, but without ſuppreſſing it altogether; or, to uſe Mr. Home's words, "A ligature being made upon the femoral artery impeded the paſſage of the blood into the ſac *ſo much*, as to allow it in *ſome meaſure* to collapſe, and its contents to *coagulate* *."

While the theories were ſo very imperfect, the practice could not be good. There are two purpoſes here diſtinctly marked: Firſt, That the ſurgeon ſhould have it in his power at all times to open the wound, to look into the bed of the artery, to touch his ligatures, to draw the knots tighter when at any time they ſeemed looſe, or to tie the occaſional ligatures, when the firſt ligatures chanced to give way: Secondly, Since the purpoſe of the operation was not to interrupt, but only to moderate the flow of blood, it was judged better to accompliſh this by a ſucceſſion of ligatures ſlightly drawn, than by a ſingle ligature firmly tied. The operation was, indeed, ſuch as accompliſhed theſe two purpoſes perfectly; the artery could always be ſeen, the ligatures could always be found, the ſtrings or tapes lay thus under the artery for fifteen or twenty days, and the artery thus inſulated never failed to burſt, ſo as to give the operator a fair opportunity of trying the ſtrength of his occaſional ligatures, and of adding, beſides, whatever ingenious inventions he could fall upon.

The operation of tying the artery was performed by Mr. Hunter in the following manner: "Having diſengaged the artery from its *lateral connections* with the knife and from the *parts behind it*, by *means of* the end of a thin ſpatula, a double

* London Medical Journal, 1787.

ligature was paſſed behind it by *means of* an eyed probe, and the artery tied *by both portions* of the ligature, but ſo ſlightly as only to compreſs the ſides together; a ſimilar *application of ligature was made* a little lower;" and the reaſon for paſſing four ligatures was, " to compreſs ſuch a length of artery as might make up for the want of tightneſs, as Mr. Hunter choſe to avoid great preſſure on the veſſel at any one part *." The reſult of this operation was what one might eaſily have prognoſticated, viz. that the patient was in extreme danger of his life. " On the ninth day after the operation there was a conſiderable diſcharge of blood from the part where the ligatures paſſed out; a tourniquet was therefore applied on the artery above, which ſtopped the bleeding; and although the tourniquet was taken off a few hours after, no blood followed. The head of a roller was now placed upon the wound in the direction of the artery, which was not tightened more than was thought ſufficient to take off the impetus of the blood in that portion of the artery." Thus we ſee, that the iſſue of this operation, even in the firſt and moſt ſucceſsful caſe, was a burſting of the artery, from which the patient was ſaved perhaps by a clot of blood forming in the artery, maintained by the continual preſſure of a half ſcrewed tourniquet; thus we find the artery giving way, although tied far from the ſeat of diſeaſe; we find nothing in the narrative of the caſe implying, that the operator, while tying the artery, felt it criſp, hard, enlarged, or anyhow inclined to diſeaſe; we find the artery not giving way till the ninth day; and you will preſently be ſatisfied that it is generally betwixt the ninth and the fourteenth day that the artery burſts, as if its burſting were the conſequence of ſome regular proceſs of inflammation and ulceration, and happened always at a certain ſtage of the diſeaſe; you will find the artery burſting always at the very time when, if tied and cut acroſs, and put in the ſame condition with the artery of an amputated limb, it ſhould be paſt all danger.

Next after Mr. Hunter, the inventor of the operation, Mr. Birch performed it in St. Thomas's Hoſpital; and he improving upon theſe methods of inſulating the artery, ſeems to have ſtripped it down very carefully betwixt his finger and thumb. This was done in the caſe of one John Lewis, a negro, whoſe aneuriſm aroſe from a blow upon the fore part of the thigh. " After cutting the faſcia," ſays Mr. Birch,"

* An account of Mr. Hunter's operations for the popliteal aneuriſm, in a letter to Dr. Simmons, by Mr. Home, p. 395. Had Mr. Home reflected a moment on the manner in which his four ligatures came away, without the loops of them being cut; he might have learned, that they did ſomething more than moderate the force of the blood.

" the finger and thumb could ſurround and compreſs the veſſel; an eye-probe, armed with a *ſtrong ligature*, was then puſhed through the cellular membrane, and carried under the artery. This being effected, we had ſuch command of the veſſel as to be able *to ſtrip it down*, and paſs another ligature ſomewhat lower. The laſt ligature was then tied, *the firſt being left looſe to ſecure us againſt accidents.*" Theſe unhappy contrivances for ſecuring the artery, are in truth the cauſes of accidents. What was the iſſue, for example, of this caſe? On firſt reading it, we ſhould believe, that the ſecondary hæmorrhagy of which the patient died, had proceeded only from the burſting of the aneuriſm; but we ſoon ſee, that here alſo the artery itſelf had given way. It was on the eleventh day after the operation that the patient expired; and upon diſſecting the limb it was found, " that water, injected by the internal iliac artery, eſcaped freely from the wound at the ligature, where the artery was open, and appeared to have ulcerated at that part; and in ſlitting up the artery from the ligature to the heart, its internal ſurface appeared of a bright red." Thus the inoſculations are in ſuch caſes enlarged, the heat reſtored, and the limb ſafe; gangrene is not the cauſe of death; the patients die of hæmorrhagy; they die not on the third or fourth day, of gangrene; but on the fifteenth or twentieth day, of hæmorrhagy; they are loſt, not from the want of the proviſions of nature againſt interrupted circulation, but from the imperfection of our operations *.

The report of this method of operating having paſſed over to Paris, the French ſurgeons of La Charité improved with ſingular ingenuity upon the miſtakes of

Artery tied with four Ligatures

Bell scula

* The condition of the artery, as tied with theſe ſucceſſive ligatures, may be repreſented by this plate, where the ligatures (a a) are drawn firm, and have killed the piece of artery (b), where the ligatures (c c) are either drawn very ſlightly, to prevent the too violent impulſe of the arterial blood againſt the others, or are merely laid under the artery, to ſerve in caſe of the artery giving way at the firſt ligatures. But the ſure effect of ſuch relays of ligatures is, to detach the part (d d) of the artery from the ſurrounding cellular ſubſtance; it muſt die along with the portion (b), or, falling into a ſtate of ulceration, it will burſt. The ſecond ligature at (c) may then be tied, and will ſtop the artery for a time; but that part of the artery is inflamed, the part under the ſecond ligature is in a ſtate of ulceration; the proceſs of ulcera-

the Engliſh ſurgeons. They will pardon my allowing them only the ſecond place, though they ſeem very well inclined to ſteal into the firſt, and to take to themſelves the whole merit of theſe improvements, ſuch as they are *.

M. le Comte invented a way of curing wounded arteries which has been admired as ingenious. He ſlit up a quill on one ſide, which, when unfolded he applied to the artery, and allowed it to cloſe again, ſo as to encircle the artery; and in order to compreſs the wound of the artery with better effect, the quill was lined with a very fine ribbon, and the ends of the ribbon ſerved for tying the artery. This propoſal was received by the Medical Society of Paris with ſome degree of applauſe, and a committee was appointed to make experiments. But the proceſs which goes on in an artery thus inſulated was not conſidered, or elſe the event of ſuch experiments might eaſily have been foretold. An artery being thus ſurrounded with a foreign body and completely inſulated, muſt undergo one of two changes: Firſt, If firmly compreſſed, as when we apply the common ligatures, drawing them tightly, it would be not merely obliterated in its canal, but entirely cut acroſs, and accordingly the ligatures would come away on the fourth or fifth day: Secondly, When thus encaſed in a quill, it would probably only inflame, its coats would thicken, the blood would coagulate above and below; the artery would continue alive, but by this inflammation and thickening of its walls, its canal would be obliterated, and the courſe of the blood in it be as effectually ſtopped as if it had been cut acroſs by a ligature drawn firm.

This accordingly was the iſſue of the experiments performed by the Committee upon Animals; they generally found the canal of the artery obliterated; it was

tion, far from being ſtopped, will be accelerated by tying this ſecond ligature, ſo that in its turn it alſo will give way, and the patient bleed to death. It would appear, that when an artery is once brought into this ſtate of ulceration, the danger does not end with the failing of the ligatures; for in the ſecond operation performed by Mr. Hunter upon a trooper, the ligature came away on the fourteenth day; on the twentieth a ſlight bleeding came on, and a few hours after the hæmorrhagy returned, and he loſt a pound of blood before the tourniquet could be applied. The artery was then laid bare, and tied a little higher up, but too late, he fell very weak and low; on the twenty-third day he bled again, and on the twenty-ſixth the bleeding returned, he became faint and delirious, hickup came on, and he expired. This is a ſad ſtory. The patient was a young man; the artery was tied in the found part of the thigh; it was tied, indeed, ſimply enough; but the cauſe of this hæmorrhagy is ſufficiently obvious: "Upon examining the limb, ſinuſes were found running along the bed of the artery, upwards and downwards, and along the Sartorius muſcle, beſides ſmaller ones (i. e.) abſceſſes, in different directions.

* *Vide* Fourcroy, Vols. II. & III.

only in one experiment that they were able to inject the artery after the death of the animal, and in that caſe too the artery was contracted at the place where the quill had been applied. In ſhort, the effect of this operation, as of all others, was to obliterate the artery. We have even reaſon to believe, that if a wounded artery were ever cured by ſtitching the lips of the wound together, the cure would be accompliſhed only by inflaming the artery, ſwelling its coats, and obliterating its cavity; for that operation which was firſt propoſed by Mr. Lambert of Newcaſtle, and afterwards repeated by me, has ſince then been repeated in the way of experiment by Conrad Aſman, in preſence of Bouſch, Allardi, P. Drieſſen, and others. Theſe gentlemen have invariably found the canal of the artery quite cloſed; and in puſhing probes or Annell's wires along the courſe of the obliterated artery, they have uſually found, that at the point where the wire was ſtopped by the adheſion of the coats of the main artery, the point of the wire turned off eaſily into a collateral branch, which was proportionably enlarged *. Nor have they found the experiment to be even a harmleſs one, nor this way of obliterating the artery a good ſubſtitute for the ligature: for the inflammation which obliterated the artery at the part where the blood was no longer allowed to paſs, ſometimes proceeded to ulceration in the parts beyond, ſo that the artery burſt, with a dangerous hæmorrhagy †.

It was next propoſed by Mr. Perſy, when the femoral artery was wounded, to cut a piece of ſheet lead, ſlip it under the artery, and roll and bend it ſo as to encaſe the artery like the quill of Mr. Le Comte. This is another piece of ingenuity which muſt have been attended with ſtill more ſerious conſequences. The rudeneſs and weight of ſuch a ſheath for the artery, however it might have obliterated the wounded point, muſt have ulcerated the adjacent parts. This is a contrivance ſo coarſely mechanical, ſo directly oppoſite to thoſe proviſions by which nature ſecures a wounded artery, that it is the very thing one would have ſuppoſed in ridicule of theſe various methods of inſulating the artery. It is a very ſingular proof, that the more ingenious ſurgeons have been in their mechanical contrivances, the farther have they departed from the principles of ſurgery.

* Ex noſtris itaque experimentis ſumma, cum prudentia inſtitutis concludendum eſſe puto operationem Lambertianam ligaturæ, non præſtantiorem eſſe; ſed minus certam et minus tutam; atque ſi ſuccedit nullo alio modo, quam arteriæ coalitionem et quidem per ſatis longum tractum, inducendo, hæmorrhagiam ſiſtere, nihil itaque magis, quam ipſa ligatura efficere.

† In noſtris quoque experimentis experte fuimus hæmorrhagiæ lethati anſam dare.

When Mr. Duſchamps had occaſion to perform the operation for popliteal aneuriſm, he, like a man of real honour and good ſenſe, went into the Salle-des-Morts with his friends the evening before his operation, made various experiments, and ſettled with his aſſiſtants the manner of his operation, and all the ſteps of it. He, a man of knowledge in his profeſſion, did what an ignorant fool would have been aſhamed to do, tried the operation firſt on the dead body. Mr. Choppart, previous to an operation which he performed, had made trial of this piece of ſheet lead, but was diſſatisfied with it, and applied the ligatures in the common way. Mr. Duſchamps alſo rejected it. " In reſpect (ſays Mr. Duſchamps) to the confidence which Mr. Lowis had, in this manner of ſecuring the artery, I alſo made trial of it the evening before my operation, but whether from my awkwardneſs, or the imperfection of the method itſelf, my aſſiſtants diſapproved of the experiment, and recommended it to me to hold to the old operation with ligatures."

But it was not from principle that Mr. Duſchamps rejected this invention, it was not becauſe of the dangerous effects of this rude contrivance in inſulating and ulcerating the artery, he rejected this only to make way for a contrivance of his own ſtill more mechanical, more complicated, more ingenious, and in proportion more dangerous. " A young man having wounded himſelf with a pair of ſciſſars in the femoral artery, Mr. Duſchamps unfortunately made a falſe inciſion, he expoſed only the entire ſide of the artery! the ſide oppoſite to that on which the artery was wounded, the wounded part of the artery could not be ſeen, and the artery was ſo well ſupported by its cellular ſubſtance, that it continued full and pulſating ſtrongly. After long ſearching in vain for the wounded part, Mr. Duſchamps applied a ligature at random, that ligature chanced to be below the prick in the artery, and no ſooner was the blood thus oppoſed than it ruſhed out. This directed Mr. Duſchamps in placing the ſecond ligature, he applied it above the place of the bleeding, and a compreſs being laid upon the artery, every thing continued ſecure; by the third day the limb had quite recovered its natural warmth and feeling, and on the fourth, the dreſſings were moiſtened with a ſerous effuſion, and the digeſtion of the wound was begun; but on the ſeventh day, there came on a conſiderable hæmorrhagy, and upon lifting the dreſſings, the ligature was found relaxed, ſo that it could not have the ſmalleſt effect upon the artery. The impoſſibility of drawing the loop of this ligature made Mr. Duſchamps apply a ſecond a little higher upon the arter . He found it very difficult to draw it tight enough to ſtop the blood, yet at laſt he did accompliſh it,

but the following evening it burſt out again, the dreſſings were lifted, and the ligature was found a ſecond time relaxed. In theſe circumſtances, Mr. Duſchamps reſolved to prolong his inciſion, and tie the artery a little higher where it lies more ſuperficially, he applied the ligature, and once more ſuppreſſed the bleeding with very great difficulty, for they were obliged to draw this third ligature fully as tight as either of the former. Still the blood ruſhed out from time to time the whole of that day and of the next, which was the tenth from the operation."

" Theſe repeated hæmorrhagies having reduced the patient to extreme weakneſs, his pulſe fluttering, and his face deadly pale, ſo many ligatures having failed ſucceſſively, made Mr. Duſchamps deſpair of ſaving him. It was now neceſſary, ſays Mr. Duſchamps, to contrive ſome engine by which not only the artery might be compreſſed, but the ligature tightened from time to time in proportion to the fading of the parts; and now ſuch operations became particularly difficult, for the parts were greatly ſwelled, ſo that the artery lay very deep."

He contrived an inſtrument of ſilver, with a flat button and a ſtalk; the ſtalk allowed the inſtrument to go down to the bottom of the wound, the flat button was to reſt upon the artery as a ſmooth compreſs, and in the button were two ſlits through which the flat ligature ſurrounding the artery paſſed, the ends of the ligature being tied with a knot over the top of the ſtalk, and tightened as occaſion required. Before the inſtrument could be made and prepared the artery had begun to bleed again, the dreſſings were then removed, the ligature was found quite ſlack, and was therefore cut away. There had been an occaſional ligature laid under the artery higher up than the proper ligature, and that occaſional ligature (ligature d'attente) now ſerved for conducting a freſh tape under the artery, this tape was paſſed through the ſlits in the machine and tied over the top of the ſtalk, it ſuppreſſed the pulſe in a moment, and from that time there happened no hæmorrhagy, and the man recovered."

Here there was no diſeaſe nor tendency to diſeaſe; the patient was a young and healthy man, wounded recently with the point of a pair of ſciſſars. But the artery lay for ten days expoſed and quite inſulated, the bed of cellular ſubſtance which ſurrounds it quite deſtroyed, and the artery inflamed and ulcerating at the point where the firſt ligature was applied; this proves, that the applying ligature after ligature higher upon the artery, ſerves but to propagate the diſeaſe; in this caſe, each ſucceſſive ligature as it was applied higher and higher along the artery

made it ulcerate and burſt anew; the machine which Mr. Duſchamps calls his Serre-Artere, ſeems alone to have been effectual.

How little this method of Mr. Duſchamps was founded on the true principles of ſurgery, I leave you to judge! how little it differed from the quill of Mr. Le Comte, the piece of ſheet-lead of Mr. Perſy, or the four ligatures of Meſſrs. Hunter, Home, Birch, Pott, and the other Engliſh ſurgeons. But I muſt explain to you how far it is from being ſecure.

The ſecond occaſion on which Mr. Duſchamps uſed his Serre-Artere, was in a natural aneuriſm in one Jean Baptiſte Gullimar, a hackney coachman in Paris, who, on the 14th of April 1792, was laid in one of the beds of La Charité, he was of about thirty-four years of age, of a ſtrong and vigorous conſtitution, it was about the end of September that he firſt obſerved, without being able to aſſign any cauſe for it, a ſmall tumor growing in the ham; its increaſe was rapid, in the ſeventh month it was as big as an oſtrich egg, the pulſation was not viſible to the eye, he felt a ſtiffneſs in the ham, and a numbneſs in the whole limb which was otherwiſe ſound.

In making his inciſion in the fore part of the thigh, Mr. Duſchamps very properly applied no tourniquet, being deſirous of having the arteries in full pulſation that he might be aware of any danger. He had two ſmall hooks, or flat handles of ſmooth white-iron with which his aſſiſtants held open the lips of the wound; but he did not diſſect the artery clean, he ſeems to have left the ſheath of the artery entire, and to have ſtruck his needle through it. He took a large ſharp aneuriſmal needle with an eye near the point, and puſhed it through under the artery; but the firſt appearance of the point of the needle was attended with a guſh of blood ſo ſudden, as to alarm the aſſiſtants, who immediately concluded that the artery was wounded, the colour of the blood, however, and the manner in which it flowed, ſoon demonſtrated that the hæmorrhagy proceeded from his having transfixed the crural vein.

The great needle now lay under the artery, Duſchamps laid the point of his finger over the artery, and found that he could compreſs it betwixt his finger and the needle, ſo as to ſuppreſs the pulſe in the aneuriſm which even ſubſided ſomewhat in ſize while the artery was thus compreſſed. He therefore put the ligature through the eye of the needle, drew it back, and ſo laid his ligature double under the artery. "I choſe," ſays Mr. Duſchamps, "to lay this ligature exactly under the middle of that part of the artery which was naked, that I might have room, if

occaſion ſhould require it, to tie another ligature above *." Now, it is this very precaution that is the ruin of all theſe operations. He took abſolutely great pains to inſulate the artery. " The ligature now put round the artery was next," (ſays Mr. Duſchamps), " held up like a bridle by one of the aſſiſtants, and pulled pretty ſtrongly, by which I had an opportunity of diſengaging it from the ſurrounding cellular ſubſtance above the ligature, which I did with the handle of my ſcalpel, and having thus freed the artery, I found it eaſy to paſs the needle again, and as I withdrew it I laid an occaſional ligature under the artery about half an inch above the firſt. Each of theſe ligatures was double, it was only the lower thread of the loweſt ligature that was tied, of courſe there lay under the artery three relays of ligatures which could be of no uſe (unleſs the firſt gave way), and which could not be quite harmleſs; beſides, he laid under the firſt ligature, a piece of agaric upon the artery, and was forced to pull his firſt ligature ſo firm before the pulſe ceaſed in the artery, that his aſſiſtant was afraid leſt the artery ſhould be cut acroſs."

Such are the operations uſually performed upon the femoral artery with every appearance of ingenuity and mechanical firmneſs, but with no attention to the ſtate of living parts, to that proceſs of inflammation and adheſion by which alone the artery is to be ſecured after theſe ligatures fall away. But this operation ſeems to have been wanting, even in that mechanical ſecurity, for the ſame evening, and no more than ſeven hours after the ſtraitening of the ligature, Mr. Duſchamps thought he felt a pulſation, and he was not deceived. In truth, the ligature had never done its office, the limb had never loſt its heat nor feeling, and the pulſation which he had perceived in the evening of the operation was very diſtinct the next day, " yet I did not," ſays Mr. Duſchamps, " apprehend this to be unfavourable; I expected from the ſlightneſs of the pulſation, that there might paſs along the main artery, juſt a ſufficiency of blood for nouriſhing the limb, while there might be at the ſame time ſuch a degree of preſſure upon it, as to enlarge the inoſculating arteries ſlowly." He reſolved not to alarm himſelf. He left matters in this ſtate for four days, but on the fourth morning he thought he could perceive the pulſation more ſenſibly, wherefore he reſolved to draw the knot upon the lower circle of the occaſional ligature. He was

* Page 306.

fearful of renewing the ſame degree of force which he had found it neceſſary to uſe in tying the firſt ligature upon the artery, and heſitated for ſome time whether to draw the common knot upon the ligature, or to draw the ligature through the ſlits of his inſtrument, his Serre-Artere. He found his ligatures embarraſſed, he was obliged to cut the knot and uſe it only as a help to draw a new tape under the artery. This new tape was laid, the Serre-Artere was ſet upon the artery, with a piece of agaric betwixt it and the ligature, and the moment it was tied, the pulſation of the tumor ceaſed, the patient felt a deep and painful ſhooting in the whole limb, the foot was ſomewhat cold, though never inſenſible, and next morning the natural heat was reſtored, though the ſhooting continued for three or four days after this new ligature was applied.

But from the moment of placing this inſtrument upon the artery, Mr. Duſchamps was as unhappy as if he had been conſcious of all the fatal conſequences of thus inſulating the artery. " From day to day," ſays Mr. Duſchamps, " I " was in perpetual fear of the artery burſting" (attendent de jour a l'autre le rupture de l'artere). How could it fail to do ſo? there was ſtill another occaſionally ligature lying feſtering under the artery, above the place where this machine and its ribbon were applied.

Mr. Duſchamps had the prudence to keep every thing in readineſs againſt any accident. The patient held inceſſantly a compreſs in his hand, ready to preſs upon the artery when it ſhould burſt. Mr. Duſchamps knew too well from experience what was to happen. Two pupils watched alternately by the patient, and dreſſings, tapes, and another Serre-Artere were kept in readineſs. On the ninth day, in the morning, Mr. Duſchamps was informed that his patient, Gullimar, was looſing blood, " I went inſtantly (ſays Duſchamps), though the ſecond ligature, d'attente, which lay higher than that, which had juſt given way, kept me eaſy. The patient having inſtantly applied the compreſs I had given him, had loſt little blood, and having every thing in order, I had but to waſh the parts clean, get out the ends of this ſecond ligature, and draw them through the ſlits in the button of the machine. This ligature was tied, a piece of agaric being firſt interpoſed, the ligature was drawn, the pulſation ceaſed, the blood ſtopped, and no accident happened from this time to the end of the cure. On the ſeventeenth day after, this ligature came away, and nine days after that, the patient left the hoſpital cured. The tumor," ſays Mr. Duſchamps, " is diſappearing, the man now follows his old profeſſion

ſafely, and we can obſerve one of the collaterals enlarging daily, and trace it eaſily by its pulſation along the ſide of the tumor *."

The dangers of theſe operations ſeemed to have touched M. Duſchamps in a proper manner, and he adds a ſentence which deſerves notice. " But to ſpeak honeſtly, this is a ſubject in which we have yet much to learn; our practice is ſtill undecided, and without principle †."

It is for your ſake, and that of humanity, that I criticiſe thus freely the practice of the greateſt ſurgeons, who are really maſters in their profeſſion, and err only in particular points, or where the art itſelf is imperfect. The hiſtory of their operations, thus critically rehearſed, muſt be intereſting to you, and muſt make you feel all the importance of the ſubject. You muſt take a lively intereſt in the condition of a patient who lies for ten days expoſed to repeated hæmorrhages, the ſlighteſt of which, if he be already much reduced, may prove fatal. Each caſe, and each new method of tying the artery brings along with it proofs of the imperfect ſtate of this piece of ſurgery. You are now qualified to diſtinguiſh the faults of each operation. You ſee that there is a perpetual deviation from the ſimpleſt principles of pathology, and muſt be convinced that every proceſs which inſulates the artery expoſes it to the danger of ulceration. You will perceive that it is the regular proceſs of this ulceration that determines the burſting of the artery, which, as M. Duſchamps himſelf obſerves, happens uſually on the 10th or 12th day. You will alſo perceive, that when ſuch operations do ſucceed, it is only becauſe the ſucceſſive ligatures had deſtroyed the intercepted and inſulated part of the artery, while

* DRAWING OF THE ARTERY AS IT LAY IN THIS OPERATION OF MR. DUSCHAMPS, DEMONSTRATING THE DANGER OF EVERY SUCH OPERATION.

† Mais ſi l'on eſt de bonne foi on conviendra que nous n'avons encore a ce ſujet aucune connoiſance bien determine."

the laſt ligature, that which holds the artery and ſaves the patient's life, is applied cloſe to the ſound parts: Above all, you will be ſenſible that no operation can be more dangerous, more unſucceſsful than theſe, ſince they do not even ſatisfy the inventors *.

In my firſt book on Wounds I propoſed that parallel which both explains to us the imperfection of our preſent operations, and the method which we ought to purſue in order to ſecure the artery of an aneuriſmal limb: "What, then, can be the difference betwixt this tying of the femoral artery in aneuriſm, that it ſhould be ſo full of uncertainty and imminent danger, and the tying of the ſame artery in amputation, where the ſurgeon thinks the death of one patient by hæmorrhagy a flagrant diſgrace †?" The difference is merely, that in the operation of aneuriſm, the artery is held inſulated and extended, and expoſed to ulceration! while in the ſtump, after amputation, the artery being cut acroſs, is allowed to ſhrink, and bury itſelf among the ſurrounding fleſh, with which in due time it adheres, and is obliterated; and it is only by cutting the artery acroſs in aneuriſm, and ſuffering it to bury itſelf among the ſurrounding parts, that it can be made equally ſecure with the artery in an amputated ſtump. This, which I formerly obſerved to be the oldeſt practice ‡, I am now to prove to you is the beſt; and the moſt inſtructive proof I can give you, after having explained the principles, is to relate from one of thoſe old authors a ſucceſsful caſe.

* The obſervation of Mr. Home, with which, in the year 1793, he inſulted other ſurgeons, is not leſs aptly applied to Mr. Hunter's operations than to thoſe which were practiſed before his time. The obſervation is couched in the following terms: "Experience has ſhown that *modes* hitherto practiſed are exceedingly precarious, *being* rarely attended with ſucceſs, *and* the death of the patient *being* commonly *a conſequence* of *a failure* of the operation; *a circumſtance* which has *led* ſome ſurgeons of great eminence to prefer the amputation of the limb in *all ſuch caſes*."

† On the Nature and Cure of Wounds, page 89.

‡ "I ſuſpect it to be alſo a point of the very firſt importance to have the wounded artery ſooner buried in granulations and in ſound fleſh; for though the healing of an artery depends always in part upon its own lively diſpoſition to inflame and adhere, yet it muſt depend alſo in ſome degree on the ſupport of ſurrounding parts. Bleeding from a tied artery ſeldom comes on till the 4th or 5th day; and if we could here, as in other great operations, lay the ſkin down and make it adhere before the 6th, or before the 12th, or even before the 26th day (as my late obſervations explain to you), we ſhould have it all ſound before the bleeding came on; but the ſurface is often large, the ſuppuration bad, the artery lies expoſed, and may be dilated, or it may be even eroded by the foul pus. Birch ſays, it was where the great artery of the thigh ſeemed to have ulcerated, that his injection ran out. Home ſeems to attribute the death of his friend's patients to great ſuppuration formed round the bed of the artery; and certain it is, that Hunter

The celebrated Roman ſurgeon Joannes Trullius performed this operation in the following manner, related by Severinus, in his book De Medicina et Chirurgia Efficaci. " A young man of ſeventeen years of age was wounded with a ball in the left thigh, about eight inches above the groin. The ball entered betwixt the rectus and gracilis muſcles on the fore part of the thigh, and paſſed out behind through the triceps. This wound was accompanied with a great laceration of parts, eſpecially of the femoral artery, and with a profuſe diſcharge of blood. Trullius, the celebrated ſurgeon and lithotomiſt, being called, found the wound already dreſſed by a barber. He left it untouched till next day, when, upon removing the bandages, he found the parts exceedingly ſwelled, and the tumor beating ſo as to raiſe the hand very powerfully when laid upon it. Trullius ſuſpected a wound of the great artery, a caſe altogether full of trouble and danger. He begged the friends to aſſociate with him ſome ſkilful ſurgeon, and named Domferante, who, when he came, was as well as himſelf very fearful of the caſe."

" Refrigerants and aſtringents were recommended; the patient was enjoined perfect quietneſs; and although occaſionally the blood burſt out to the amount

ſucceeded better, when in ſome after caſes he cloſed up the thigh immediately with ſtitches; for in one caſe he procured almoſt an immediate adheſion of the wound, and in a few weeks a perfect cure. Paree, Guy de Chauliac, and all the older ſurgeons, knew well the importance of ſurrounding and ſupporting an artery, and burying it quickly under the granulations. The Arabians, in their operations for aneuriſm, firſt tied their ligatures, and then cut the artery acroſs, ſo that either end of the artery ſhrunk (ſurrounded by its own ligature) among the ſound fleſh, and was no more ſeen. But, independently of all authority, the reaſon of the thing inſtructs us not to keep our wounded artery, as ſome chooſe to do, open, that they may ſee it and tie it when it burſts out, but to bury it ſo among the riſing fleſh that it may never be ſeen, and that in a few days it may be ſafe from burſting."—*On the Nature and Cure of Wounds.*

That Wiſeman, along with the older ſurgeons in England, were inclined to follow this method, is proved by the following paſſages. " The cure of an aneuriſma conſiſts in the timely application of proper medicaments, and bandage to reſtrain the blood and keep it within its channel; or by eſcharotics or the actual cautery you may deſtroy it. But if it lie where you may take it up, the *cure is then beſt performed by dividing it.*

" A poor fellow living in the country was accidentally, in letting blood, pricked in an artery. The arm ſwelling and growing painful, he put himſelf into another barber-chirurgeon's hands, who, by unfit applications, rarified the tumor, and made way to the extravaſation of the blood, which increaſing the tumor, and rendering it ſoft, was ſuppoſed by the barber to be a ſuppuration of matter. He accordingly opened it by knife or lancet, at which an impetuous flux of blood burſt forth, to the quantity of four flaggons (as they told me). They made a ſhift to ſtop it; but the bandage being made too hard and unequal, the arm ſwelled, and inclined to gangrene. While this poor man lay thus afflicted, we his Majeſty's and Royal

of three or four ounces, it ſtopped ſpontaneouſly. The wound was left untouched for ſeveral days; but when at laſt the bandages were undone, the pulſation, pain, fever, and ſwelling, were all increaſed. The pulſation was particularly alarming; others were called into conſultation; among ſo many there was naturally a variety of opinions, but the greater part adviſed "that this caſe ſhould be left to time and nature." What could time or nature do but mature the aneuriſm, diſorder the limb, bring the tumor on to burſting, and ſo endanger the life? Trullius alone was of a very different opinion; he adviſed that the tumor ſhould be opened, with the deſign of ſeeking for the wounded artery.

His ſenſible advice was overruled; the dreſſings and rollers were applied anew; but on the 17th day, the blood burſting out again, Marcus Aurelius Severinus was called; and the conſultation being met, all the hiſtory of the caſe was recited. The bandages were undone; they found the tumor free from inflammation, the pulſation leſs, and even the actual bulk of the aneuriſm diminiſhed, as was affirmed, not only by the gentlemen met in conſultation, but by all the attendants, and eſpecially by the barber Hyeronimus, who was always preſent at the dreſſings, ready (with burning irons I ſuppoſe) to ſtop the blood.

Highneſs's chirurgeons attending the court viſited him, and prepared for the taking up this artery, or in caſe of failure, to cut off his arm. The patient being taken out of his bed, and placed in a chair towards the light, we took off the dreſſings, and I viewed the arm; where finding no gangrene, according to the report of the chirurgeon, but rather an ecchymoſis, we made a bandage above the wound, to prohibit the influx of blood. One of the chirurgeons making a gripe thereon, we made an inciſion into the tumor, on the inſide of his arm, according to the length of it over the artery; and after we had pulled out the coagulated blood, and laid the veſſel bare, we paſſed a needle with a ligature under the artery, and tied it, then cut off the ends of it, and looſened the bandage above; and ſeeing it bleed no more, we dreſſed it up with pledgits dipt in the common digeſtive ex terebinth. cum vitell. ovi, applying them with pulv. Galeni next the artery, and lightly filled up the wound with pledgits of the digeſtive dipt in ol. roſ. warm; then embrocated the arm with ſome of the ſame oil, and laid a diachalcit. plaſter over the wound and parts about; alſo applied empl. Paracelſi and diachalcit. over the hand and arm, which were œdematous. Then with bandage we began at the hand, and rolled up to the wound, taking a turn or two over it, and ſo rolled up the axilla. He being returned again to his bed, we placed his hand upon his breaſt, and felt his pulſe beat ſtrongly in that wriſt. At the next dreſſing we found the tumor diſperſed, the wound freſh, and tolerably digeſted. We then paſſed another ligature upon the artery above the firſt; and in pulling the firſt to divide the artery between the ligatures, the artery broke, which was as well. We dreſſed it up as before we had done, only leaving out the powders. At the next opening, finding the wound in a very good condition, the lips of it being digeſted and contracted, we dreſſed it up with mundif. Paracelſi, &c. Then ſeeing it in a hopeful way of cure, I returned to London, leaving the patient to my fellows, who dreſſed it ſucceſsfully the ſpace of ten days, without any appearance of blood.

" This fact being deciſively proved, it was univerſally agreed that it would be imprudent to make any change in a line of conduct which ſeemed ſo ſucceſsful. The ſame methods were purſued, only that attendants were appointed to watch perpetually, and that the patient was allowed more wine."

Thus did matters go on quietly till the 30th day, when the blood burſt out again after the old manner, and again ſtopped of its own accord. The tumor was found ſuppurating, and ſuppuration being attended neceſſarily with the generation of fleſh, it was ſtill hoped that the artery would be healed, as it often happens. But we were deceived, ſays Severinus, for his ſtrength daily declined, his body waſted, and his face was become hypocratic. We began to deſpair; nor had we, indeed, any chance of ſaving his life, but by dilating the wound, and either tying or burning the artery."

" The father of the young man was now called in among us, the dangerous ſituation of his ſon was honeſtly explained to him, and we ſubmitted to him the ſad alternative of a doubtful operation or certain death. The uncertainty of our very operation we were forced to acknowledge, ſince it was neither ſafe in the moment of execution (for ſome blood muſt be inevitably loſt), nor even certain in its future ſucceſs. He turned away from us ſorrowful, and granting his conſent only by his ſilence.

" The femoral artery was felt for in the groin; the tourniquet was applied; then the place of the inciſion was marked with ink. Trullius made the inciſion, and extracted fully ſix pounds of coagulated blood. This blood led towards the artery. The artery, thus expoſed, was ſeparated from its vein and nerve, and tied in two places, above and below the wounded part, and with the ſame precautions that are uſual in tying varicoſe veins. The artery was divided by the ball more than one half acroſs; the remaining half of the artery was cut acroſs next day by Trullius, " leſt it ſhould contract before it putrified;" (" ne forſan partem antequam putreſceret contraheret.") Perhaps I do no more than juſtice to Trul-

In ſome of their abſence the barber-chirurgeon dreſſed the patient. Whether it was in wiping off the knot, or crowding in doſſils, but it burſt out again; yet the artery being divided, it ſoon ſtopped by the application of colcothar; and from that time it bled no more. The ancient way of deligation is, as I have already ſaid, *by tying it in two diſtinct places, and cutting the artery off between;* but the patient's often *fainting interrupted us in that work.* And truly in this caſe, where a barber was to be intruſted with the cure, it had been better that the artery had not been divided, for then it would not have been in his power to have rubbed off the ligature, and before the wound could have been ready to cicatrize, the ligature would have fallen off of itſelf, without danger of bleeding."

lius in tranſlating him in the following words: "The artery being thus divided by the ball, not merely through one half, but through two-thirds of its diameter, I next day cut it acroſs, leſt it ſhould *ulcerate* before it *cloſed* *; ne ante putreſceret quam contraheret. If this was his meaning, he underſtood the doctrine as well as the practice; at all events, we have here a good precedent for what I have propoſed, it is not the authority of Trullius nor Severinus that ſatisfies me, it is the fact thus diſtinctly related that gives a ſort of aſſurance that this method will be generally ſucceſsful. In all thoſe caſes which I have hitherto detailed, in proportion to the ſurgeon's ingenuity has been the patient's danger! in thoſe caſes where many ligatures have been uſed, where the artery has been made mechanically! firm, it has given way. In all the caſes formerly mentioned the artery has burſt out ſeveral times, and the patient was ſaved by a ſort of accident; in this caſe alone, wherein the artery was thus ſimply tied and cut acroſs, it continued perfectly ſecure. To thoſe old authorities in favour of this practice, let me add that of my friend Mr. Abernethy, who has recommended this method, and who notwithſtanding Mr. Blickes ill ſucceſs, continues ſtill to recommend it, being ſupported againſt the impreſſion of one unfortunate caſe, by a ſenſible and ſerious conviction of the principles upon which this improvement is founded †.

## RECAPITULATION.

We are now come to that period of this diſcourſe in which you ſhould begin to inquire what you have learnt, and I ſhould, on my part, recapitulate thoſe concluſions which have the moſt direct relation to practice.

1ſt, You muſt be ſatisfied, then, that an artery may be actually burſt by violence, and yet form its aneuriſms very ſlowly, even the largeſt arteries of the body after they are burſt, are ſupported in ſome degree by that firm ſheath of cellular ſubſtance which makes a part as it were of every artery.

2d, You muſt have obſerved that it is this ſtrong ſheath that forms the coat of each aneuriſm; and you may with ſome degree of truth uſe this contradiction of terms, "that every diffuſed aneuriſm is encyſted." The cyſt of each aneu-

* "Arteria non erat ad dimidiam partem lacera, veruntamen ad tertiam, una dumtaxat remanente quæ poſtera die a ligatura reſerta eſt a D. Joanne Trullio ne forſan partem antequam putreſceret contraheret."

† *Vide* Intereſting Eſſays on Various Parts of Surgery, No. III. by Mr. Abernethy of St. Bartholomew's Hoſpital.

riſm is formed of the ſheath of the artery, ſupported by the ſurrounding cellular ſubſtance which is condenſed often into a bag ſo firm, and ſo connected with the artery, that aneuriſm from wounds, and more eſpecially aneuriſm from burſting of the arterial coats, may reſemble a natural aneuriſm, and its ſac be miſtaken, eſpecially in coarſe diſſections, for a dilatation of the artery itſelf.

3d, You will ſee that it is in conſequence of this kind of ſupport that the greateſt arteries of the body, the femoral artery, the popliteal artery, and even the aorta itſelf, form their aneuriſms ſo very ſlowly. You will obſerve the ſac all on one ſide covering and preſſing upon the artery, which ſhows it to be not a natural, uniform, and general dilatation of all the arterial coats, but a partial yielding of the artery; and when you recollect how eaſily an artery may be injured, when you obſerve alſo that the ſtrain of the muſcles which tears the great Achillis tendon, cannot but have very dangerous effects on an artery, you will be attentive to ſymptoms of which others would think lightly; you will be able to trace the affection to its true cauſe, and be aware of its nature early; you will foreſee the dangerous conſequences of delay, and be prepared both to give a deciſive opinion, and to adopt active meaſures proportioned to the real dangers of the caſe. You know how dangerous it is to conſider pulſation as the inſeparable ſign of aneuriſm, how entirely the pulſation ceaſes in the latter ſtage of the diſeaſe, and you know that of all tumors, aneuriſm is moſt deſtructive to the bones, joints, and ſurrounding ſoft parts, and ſhould, leaſt of all, be allowed to grow to any dangerous ſize.

4th, You muſt be ſenſible, that while aneuriſm increaſes in ſize, it gradually oppreſſes the main artery of the limb more and more; the inoſculations enlarge, and the change of circulation which we attribute ſolely to our operations, is in a great degree the work of nature. The limb on which we operate for aneuriſm can never be endangered by want of blood; all the dangers of the operation ariſe rather from the intenſe action of the leſſer arteries of the limb; this is the reaſon why a large inciſion falls into gangrene; ſuch a ſtate of the limb is equivalent to the high inflammation of a fractured limb, and it is hence that the ſtump, (when we perform amputation) runs into gangrene.

5th, You are well aware of the danger of performing any operation in the ham itſelf. The cavity is narrow, the parts compreſſed, the bones and joint eaſily affected, the artery not eaſily found. If you ſeek the artery there, your inciſion muſt be large, and a large inciſion, combined with the turged ſtate of the

limb, will bring on high inflammation, followed by gangrene. The inciſion muſt be deep, and as the inoſculating arteries cannot eſcape, if in your operation you cut but a few of them, you will have a ſecondary hæmorrhagy from channels which you cannot command! if you cut many of thoſe inoſculations which at the moment of your tying the main artery ſhould ſupport the limb, it may fall into direct gangrene from a total want of blood, not preceded by increaſed heat and inflammation of the wound, but by coldneſs in the lower part of the limb.

6th, You know that all that is required towards completing the natural proceſs, and turning the tide of blood upon the inoſculating arteries, is to tie the main artery, and that by performing this operation on the fore part of the limb, you cut no inoſculations, you expoſe no bones, and you have no difficulty in finding the artery. You have no temptation to ſtrike in your needles clumſily, nor to put your ligatures coarſely about arteries, veins, nerves, and all! ſo as to make the ligatures looſen from the parts very ſlowly. You have it in your power to diſſect the artery clean, to cut up the ſheath in which it is encloſed, and ſeparate it diſtinctly and deliberately from the vein and nerve.

7th, You are well aware, that after all that has been ſaid of gangrene, few have died of it! that many have died of hæmorrhagy from the burſting of the artery! that this burſting of the artery proceeds from ulceration of it, which is the reaſon why it burſts uſually about the tenth or twelfth day. You muſt be ſatisfied that every mechanical contrivance for ſecuring the artery inſulates it; that every artery by being inſulated and held off from uniting with the parts which ſhould ſupport it muſt ulcerate; that Mr. Hunter's operation upon the ſound part of the artery, is not more ſecure than that which was before his time performed in the ſeat of the diſeaſe, in the cavity of the ham itſelf. You will, I doubt not, aſſent to that concluſion which I have deduced from innumerable facts, "That the more of mechanical ingenuity appears in any operation of this kind, the farther has the operator departed from the true principles of ſurgery." That the ſurrounding of an artery with four ligatures, with ſplit quills, with plates of lead, with pieces of bend leather, with compreſs of agaric, cork, &c. are as inconſiſtent with the proceſs of nature as the ſewing of an inteſtine round and round with a double row of ſtitches.

8th, The right way of ſecuring a great artery, is perhaps one of the moſt important points in ſpeculative or practical ſurgery! To tie the artery at two places, to cut it acroſs to let the ends retire among the ſurrounding fleſh, to let it

ſhrink entirely out of ſight, to allow it thus a fair chance of connecting itſelf again with the other parts, and of ſuppurating, adhering, healing along with them, is probably the only way of giving the artery, which is tied in aneuriſm, all the ſecurity of an artery tied on the face of a ſtump in amputation.

Now, Gentlemen, I have done my duty. I have drawn out in this aphoriſtical form, a few of thoſe concluſions which are to ſerve you as principles in this branch of ſurgery, and while I have been employed in proving thoſe principles, I have been careful to lay before you a full view of the ſubject. Far from ſhrinking from the taſk of criticiſm, I have been careful to ſelect for you examples of good and of bad practice; I have made you familiar with all the intereſting and difficult queſtions in pathology; I have taught you to reaſon upon each individual caſe; I have, as it were,—brought you to the bedſide of your patient, and made you more than mere ſpectators in theſe ſcenes of diſtreſs.

# DISCOURSE IX.

## ON WOUNDS OF THE ARTERIES; OF THE ANEURISM WHICH FORMS OVER THE WOUNDED ARTERY; WITH GENERAL INSTRUCTIONS AND RULES OF CONDUCT FOR THE OPERATIONS ON GREAT ANEURISMS.

### SECTION I. OF OPERATING ON GREAT ANEURISMS.

I HAVE been hitherto employed in explaining to you the complicated anatomy of aneuriſms, the value of inoſculating arteries, and the condition of an aneuriſmal limb. I have taught you how to conſult, but as yet I have not taught you how to operate. The deſcription which I have given will enable you to reaſon on the nature of the diſeaſe, but other deſcriptions are neceſſary before I can teach you how to operate in actual wounds of the arteries.

I will now explain to you the nature of that tumor which riſes over a wounded artery, not where the artery is cut acroſs at the bottom of a wide and open wound, for there it throws out its blood unreſtrained, and either it is preſently tied or the patient bleeds to death; but where a great artery is wounded deep among the muſcular fleſh, where it is punctured, for inſtance, with a knife, bayonet, or ſword, or cut by a bullet, or ſplinter of ſhot. The blood eſcapes with difficulty through the narrow wound, there is little outward bleeding, the artery bleeds chiefly within! and by that inward bleeding, a tumor is ſuddenly formed of the moſt dangerous nature, requiring almoſt as ſudden an operation as if the wound were open and the veſſel quite expoſed and pouring out its blood. The artery indeed is ſtill open, it is pouring out its blood among the internal parts, and nothing reſiſts it but the ſkin! if that ſlender barrier gives way, the patient dies with one guſh of blood.

### OF THE MANNER IN WHICH THE OUTWARD WOUND IS HEALED, AND THE ANEURISM FORMED.

When a man is wounded in any great artery, the blood flows in ſo full a ſtream, that in a moment he faints, and it is then only that the by-ſtanders can

command the blood (by gathering up any cloths that are at hand, and cramming them into the wound in a confuſed and ineffectual way), till at laſt the ſurgeon comes and ſtops it altogether. Now, the ſurgeon at the firſt ſight of ſuch a wound is himſelf alarmed, he fears that it is the great artery of the limb; he is unwilling to lay open the arm or thigh, and to undertake the tying up of the great artery without ſome farther help and advice; he throws off the looſe cloths or bandages; lays a firm compreſs fairly upon the wound; rolls it with a ſteady bandage, and leaving a tourniquet about the limb, informs the friends of his fears, and of all the expected difficulties and dangers of the caſe, and deſires that ſome conſulting ſurgeons may be called. The conſultation proceeds at firſt upon theſe points, the place of the limb that is wounded; the ſhape of the weapon; the deepneſs of the wound; but the conſulting ſurgeons do not in general unbind the wound (at leaſt if it be a deep and pointed wound), till the ſkin has adhered, till the aneuriſmal tumor is formed, when being enabled to undo the dreſſings without any danger of farther bleeding, they have all the caſe before them.

The tumor riſes higher and higher every day; at every viſit they ſee a change. The tumor is large, hard, circumſcribed, and beats very ſtrongly; the ſkin over it begins to inflame, the wound of the knife threatens to open again, the whole limb is feeble and cold; the ſurface of the tumor is livid, and in a few days the beating from ſuch an artery, as the femoral artery, is moſt alarming, and to the patient very awful; he lays his hand upon the tumor, and feels it beating, like the heart in its ſtrongeſt palpitations. He is laid with tourniquets round the limb; he perceives by theſe precautions, and he feels ſenſibly, that ſhould the tumor burſt during the night, he muſt loſe his life with one guſh of blood. Lying in this anxious condition, he is watched continually till the hour appointed for the operation arrives; and it is then only (however great the ſurgeon's fears about this operation), that the patient is in any degree ſafe.

It is not always that the ſurgeon has his mind ſo made up to the tying of theſe great arteries, as to perform his operation at the firſt viſit; and yet he may as well do ſo! for whether he, by reaſoning, convince himſelf that it is ſafe, or apprehend it to be dangerous to tie the great artery of the limb, ſtill the circumſtances of the wound are the ſame, the artery itſelf (whether it be the great artery or a branch, whether it be only punctured or cut acroſs), is loſt to that limb; the tying of it is no ſacrifice, and as to the aneuriſm it is uncontroulable. Aneuriſm never ſtops; the wounded artery cannot heal; the blood ſpreads every

day wider and wider among the cellular ſubſtance, the parts are diſordered, the bones corrupted, the ſkin at laſt is ready to give way, and nothing can ſave the patient but an operation; the ſurgeon has, indeed, the privilege of delaying his operation for a week or a fortnight, but not without infinite danger to the patient in the mean time, and a more difficult operation, and more extenſive diſeaſe in the end.

Theſe conſiderations ſhould determine the ſurgeon how to act in this critical moment. When called in good time to ſuch a wound, he ſhould clap the point of his finger upon the wounded artery, or make his aſſiſtant hold it while he lays open the wound more freely, obtains a diſtinct view of the artery, and draws it out from among the cellular ſubſtance if it be cut acroſs, or if it be only punctured paſſes his ligatures under it with the needle, the eyed ſilver probe, or any inſtrument that is moſt at hand. Thus may he prevent the aneuriſm, the extravaſation of blood, and the deſtruction of the parts.

But in nine of ten caſes, the ſurgeon wants the courage to do this (which he thinks a hopeleſs operation) upon the ſpot. He is anxious to have the ſupport and countenance of others of the profeſſion, he is afraid of a wounded artery, and ſhrinks from one of the moſt natural operations in ſurgery; for, even a man uninſtructed in our profeſſion, would inſtinctively try to ſtop a bleeding artery. The caſe accordingly falls to be decided by ſlow and heſitating conſultations. The ſurgeons debate, Whether it be the trunk of the artery that is wounded? Whether if it be the trunk it ſhould be tied? Whether the inoſculating arteries are ſufficient for the circulation of the limb? Whether the limb ſhould not rather be cut off? and thoſe important queſtions, thoſe general axioms of ſurgery, which every ſurgeon ſhould have ſtudied thoroughly, are debated upon in the moment of conſulting on an actual wound! Thus it happens that the outward wound is compreſſed, the outward bleeding prevented, the blood no longer eſcaping outwardly, but extravaſated within the faſcia, removes the artery from the external wound, and this wound being walled up on its internal ſurface with clots, is allowed to heal! then the ſkin and faſcia adhere, the inward bleeding ſtill goes on, and the regular aneuriſmal bag is formed.

Perhaps there are certain circumſtances, in which it is even our duty to bring the caſe into this ſhape; for example, if there be a wound of the great arteries in the back of the hip, in the groin, in the armpit, we cannot command the blood eaſily; we are not ſure of clapping our finger down upon the artery, at the

very point where it is wounded; we are afraid leſt the patient ſhould die (even after we have come to him), with one ſingle guſh of blood; we therefore cloſe the narrow wound, put its lips together, ſettle it with a very ſteady compreſs and bandage, and try to make the lips adhere, and then we have a fair aneuriſm, which we can look upon compoſedly; we can reflect upon the courſe of the wound, and calculate which artery is moſt probably wounded; for beſides the main trunk there are other arteries in the armpit and the thigh, as the arteries of the ſcapula or the arteria profunda, which, when wounded, will form aneuriſms as large, though not ſo dangerous as thoſe of the axillary or femoral arteries, and to be diſtinguiſhed from them chiefly by the continuance of the pulſations in the wriſt or ancle.

Conclusion.—You have had the whole of the facts which relate to the value of inoſculating arteries, diſplayed before you, you know that theſe arteries are ſufficient for any purpoſe in all parts of the body, you know that it is not neceſſary that the tide of the circulation ſhould be gradually turned into them, but that we are perfectly ſucceſsful, though they have not been ſlowly enlarged. You are aſſured that theſe arteries are ſufficient to ſave the limb, and can have no difficulty in attributing the gangrene, which ſometimes happens in the laſt ſtage of aneuriſms (or which follows operations), rather to inflammation than to want of blood. You will hold it as an eſtabliſhed rule of ſurgery, that a great artery when wounded, muſt be tied; and in thoſe caſes even where you cannot find the artery, when you dare not ſeek for it, when you have not the neceſſary inſtruments nor aſſiſtants for tying the artery, when the patient is reduced too low for you to venture upon any operation, when you dare not in the ſlighteſt degree open up the wound; even in theſe circumſtances though you dare not immediately attempt to ſecure the artery, you will take the earlieſt opportunity of ſecuring it, and will prepare for performing your operation as ſoon as the patient has recovered from the firſt loſs of blood.

### OF THE ANEURISMAL SAC.

The arterial trunks and all their greater branches in every part of the body lie under the faſcia; and ſeem to owe no leſs to the ſupport of the faſcia, than the muſcles themſelves. Over the whole body the faſcia is almoſt equally ſtrong; the ſkin and faſcia, when the wound of an artery is cloſed with compreſſes, are preſſed together and adhere; the blood, by this accident, is always driven hard under

the faſcia, and is never diffuſed under the ſkin; the ſkin merely covers the aneuriſmal tumor; while it is the tenſe faſcia that gives form to the aneuriſm, and conſtitutes its ſac. The faſcia, thus confining the blood, limits the ſize of the tumor, gives it a fair and circular form, is itſelf tenſe and firm, livid alſo by the colour of the contained blood, and ſhining like the inner ſurface of the gizzard of a fowl. The ſkin and faſcia may be cut diſtinctly from each other, as freely, as we cut the ſkin above a diſeaſed breaſt without touching the hardened gland, as we draw our knife along the ſurface of a hernia, without touching the ſac, or as we cut the ſkin above the hydrocele without touching the vaginal coat.

Nor is the ſurface of an aneuriſmal bag very irregular, even upon its back part, for each muſcle is involved in its own faſcia, ſo that the faſcia is alſo of tolerable ſtrength within; the internal proceſſes of the faſcia, viz. thoſe which encloſe the individual muſcles, thicken when compreſſed by the effuſed blood and the condenſation of the cellular ſubſtance, as it is driven cloſer by the blood, ſets ſome bounds to the extravaſation within. Thus the blood is no more diffuſed among the fleſh than under the ſkin; the blood coagulates in all the extreme parts of this circle of extravaſation, and by being kneaded as it were into the cellular ſubſtance, gives a peculiar firmneſs to the tumor.

The faſcia, then, makes the great covering of every aneuriſm, but the ſtrength and conſiſtence of the ſac, and the ſucceſſion of parts, muſt vary infinitely according to the nature of the wound. If the aneuriſm be in the thigh, and be formed by a fracture of the thigh bone, inſtead of being formed only under the general faſcia of the thigh, it will extend under all the muſcles; and in that caſe the cellular ſubſtance which connects the muſcles with the perioſteum, and thoſe diviſions of the general facia which connect the ſeveral muſcles with each other will form the ſac. The vaſtus externus, vaſtus internus, and the rectus cruris, will lie extended over the whole ſac; the general faſcia of the thigh (extended in its turn over the muſcles) will thicken, and form an outward capſule, as it were, including the whole tumor, muſcles and all; and over that will be the ſkin quite moveable, and disjoined from the faſcia by cellular ſubſtance, except in thoſe parts of the ſurface near where the wound is, and where of courſe the ſkin is fixed by inflammation.

But if the femoral artery be wounded with a ball or knife, either cut entirely, or almoſt entirely acroſs, this will be the condition of the parts. The ſkin and faſcia

will be united, the ſkin and faſcia will form the two coats of the tumor, the blood will be widely diffuſed both before and behind the wounded artery, and the cellular ſubſtance which ſurrounds the artery being undermined by the blood, the artery itſelf will lie at the bottom of the aneuriſm wholly inſulated.

If the aneuriſm be formed by a ſmall puncture on the fore part only of the artery, it may happen that the blood will not ſeparate the artery from the ſurrounding parts; the general faſcia of the thigh will form the aneuriſmal ſac, the blood will lie altogether on the fore part of the artery, and the artery itſelf will lie imbedded among the muſcles, almoſt concealed by the inflammation and thickening of the cellular ſubſtance, none but the wounded part appearing.

When the aneuriſm is in the bend of the arm, the artery lies ſuperficial, is covered only with the faſcia and ſkin, and the faſcia makes the ſac of the aneuriſm. The faſcia is at this place peculiarly thick and ſtrong, it reſiſts very powerfully, the aneuriſm is not that diffuſed tumor that is generally imagined, it is as fairly circumſcribed as any ſacculated tumor; and ſo elaſtic is the faſcia, and ſo much are the parts ſtraitened within, that the moment the inciſion is made through the ſkin the aneuriſm protrudes, the ſkin retires on each ſide, and the ſac appears as fairly circumſcribed as if the inciſion had been made over a hernia or a hydrocele.

Conclusion.—Thus the ſucceſſion of parts regulates the ſeveral ſteps of our operation. Our firſt inciſion penetrates the ſkin and cellular ſubſtance only, and unleſs the aneuriſm be on the point of burſting, this inciſion never touches the ſac, but is carried lightly through the ſkin over the tumor, ſo that the ſkin retires on each ſide, and the tumor protrudes. Our ſecond inciſion is made through the ſac, the tumor protrudes, and the tranſparent faſcia which forms the ſac allows the blood to be ſeen through it. The tumor is of a purple colour, ſhining and tenſe; the lancet is ſtruck into the top of this tumor, the blood begins to roll over the edges of the inciſion, or to be thrown out in great clots; the ſurgeon introduces his finger, and runs his knife upwards and downwards along the whole length of the tumor. To uſe a ſcoop for the blood is abſurd; it is very like the formality of a ſyſtematic writer to commend ſuch an inſtrument, but it is very unlike a practical or dexterous ſurgeon to uſe it, or even to lay it among his inſtruments. He turns out the clots with his fingers, and then ſees the artery lying flat at the bottom of the tumor. The ſucceſſion of parts is very regular, yet, ſince the form of the aneuriſm is various, ſince no diſſection of the ſound parts, no deſcription of aneuriſm, can give a perfect idea of the relation of parts to each other, let the ſurgeon

be prepared for difficulty and confuſion; let him prepare himſelf for encountering ſuch difficulties, by conſidering the duration and progreſs of the diſeaſe, and the manner in which the artery was wounded. Let him try to imagine how the parts will lie with regard to each other, whether the aneuriſm be under the faſcia only, or under the muſcles, whether the parts be ſeparated from each other, or maſſed together by inflammation, and by the blood driven in among the cellular ſubſtance.

Thus the advantages to be derived from an aneuriſmal bag being formed over a wounded artery, either before we are called, or by our own compreſſes forcing the wound to heal, are theſe. That we are not hurried, all at once and unprepared, into the midſt of a bloody operation; that we are ſomewhat eaſy about our patient's immediate ſafety, there being no danger of immediate bleeding, at leaſt for a few days; that we have timely warning of every danger, by the changes on the ſurface of the tumor, which turns livid, inflames, and gangrenes, before it burſts. The wound ſuppurates, opens, and diſcharges a thin ſerum, before the actual blood burſts out, whence we have time to conſult, to calculate which artery is wounded, and to ſettle all the ſteps of our operation as deliberately as on any ordinary occaſion.

### OF THE CONDITION OF THE SURFACES OF THE ANEURISMAL SAC.

But it is equally plain, that though a recent aneuriſm is thus managed with more eaſe to the ſurgeon, and leſs loſs of blood to the patient, than a large and open wound; yet an old aneuriſm, ſuffered to grow for weeks or months, is attended with greater danger. For if the artery be very great, as in the hip or thigh, the bag enlarges very rapidly, all the parts are compreſſed and hurt, the blood is driven deeper and deeper among the muſcular fleſh, and at the ſame time that the ſoft parts are diſordered, even the bone may be ſpoiled, which muſt render the operation ineffectual in ſaving the limb. The ſame accumulation of blood that makes it more difficult to find the artery, preſſes it deeper every moment, and farther out of the reach of the ſurgeon; the ſac, in an aneuriſm of the thigh, becomes, in a few weeks, capable of holding ſix or ſeven pounds of blood, and this extenſion of ſurface is the cauſe of profuſe ſuppuration, which (whereever the matter is, as in this caſe, contaminated with blood), is never kindly.

Two things conduce to throw the whole of theſe ſurfaces into a very unfavour-

able condition: Firſt, The ſkin is ſo extended that its veſſels are compreſſed, it is deprived almoſt entirely of circulation, and becomes livid, like a ſtrangled part; at laſt it falls into actual gangrene; and ſuch is the morbid condition of the external ſurface, that frequently the parts are hardly to be diſtinguiſhed from each other; the ſkin, faſcia, and coagulated blood, are all one pulpy maſs. We have no reaſon for ſparing ſuch ſkin, it cannot recover its healthy ſtate, and in thoſe caſes where the aneuriſm has been thus extended to burſting, it has been often neceſſary to cut part of it away. Among the old ſurgeons, as Saviard, Severinus, and Ruiſch, we find, that the operation for aneuriſm was ſo much dreaded, that it was never voluntarily performed; aneuriſm was often at the point of burſting before the ſurgeon would put his hand to it; he operated only in extremis, with no other deſign than to ſave the patient from immediate death; and this is the reaſon why thoſe old ſurgeons very generally began their operation with a crucial inciſion, and finiſhed by cutting off, with great ſciſſars, the four flaps or corners of the ſkin.

While the ſurface of the tumor is thus paſſing through the various ſtages of ſuffocation and gangrene, the parts within are not in a much happier ſtate for recovering. The preſſure is mutual, the internal ſurfaces are compreſſed, while the outward ſurface is extending, and the blood is ſo driven in amongſt the cellular ſubſtance that it is choked with the extravaſation; the ſmaller veſſels of the internal ſurface are ſuffocated, and the blood ſuppurates out from among the cellular ſubſtance very ſlowly, and with a very foul diſcharge, whence the whole inward ſurface of an aneuriſm often ſloughs like a gun-ſhot wound. This is perhaps the cauſe ſometimes of ſecondary hæmorrhagy, ariſing from the ulceration of the ſmaller arteries, and the univerſal bad condition of the ſurface. The older ſurgeons provided for this. They cauterized the ſac of an aneuriſm with red hot irons, becauſe of its being a ſurface which muſt neceſſarily ſlough; and they dreſſed the baſin of the ſore, like that formed by a cannon-ball, with hot turpentine, and powders compoſed of nitre, myrrh, and other antiſceptic gums.

Conclusion.—Though it is not our practice (nor is it neceſſary even in the largeſt aneuriſms) to make crucial inciſions, to cut away the flaps, to extirpate the ſac, or to cauterize the ſurface, by which the ancients thought to dry up the putridity, and promote the ſloughing; yet this gangrenous condition of the wound is never to be overlooked; and the filling of ſuch a ſac with lint covered with powders of myrrh and bark, or of ſtimulating it occaſionally with turpen-

tine dreſſings, or a ſpirituous balſam, is peculiarly proper. And ſince we foreſee this ſloughing ſtate of the ſore, and are aware that the blood which remains is apt to hurt the diſpoſition of the wound, we ſhould perform no part of the operation more carefully than that of cleanſing the ſac. Inſtead of merely clearing away the great clots of blood, ſo as to ſee the wounded artery, we ſhould waſh and ſponge it with particular care, fill it ſlightly with caddis or ſcraped lint, and compreſs it moderately with a general bandage.

### OF THE CONDITION IN WHICH WE FIND THE ARTERY.

There are but two conditions in which the artery is found, and from the ſtate of the artery concluſions of ſome importance may be deduced. I have reaſon to believe, that in almoſt all aneuriſms, the artery lies quite inſulated. The blood paſſes along the ſheath of the artery, and diffuſes itſelf among the cellular ſubſtance with which the ſheath and the artery are both ſurrounded. Thus the blood penetrates eaſily behind the artery, whence the artery lies along in the cavity of the aneuriſmal ſac, ſurrounded with blood; you may ſlip a probe under it, you may almoſt put your finger round it, you may ſometimes lay hold of it with your finger and thumb, and paſs your ligatures almoſt without the help of any inſtrument. "The muſcles," ſays Severinus, "are ſo ſeparated from one another, that the blood which ſeparates them being hooked out, the artery is found at once, as if it had been diſſected *." The eaſe with which the artery is found, has been repreſented as no ſmall advantage, and from this has been deduced a very dangerous concluſion, viz. that the longer the operation is delayed, the more eaſily is it performed!

But it ſometimes happens, that the blood lies only on the fore part of the artery, that the blood has not been driven deep among the cellular ſubſtance which ſurrounds the artery, that the blood and general tumor preſs the artery down againſt the ſurface of the muſcles; the cellular ſubſtance ſurrounding the artery is thickened, the muſcles are inflamed, the artery is attached to the parts which form the back part of the ſac, it is nitched in among the muſcles, and is not to be diſtinguiſhed but by the jet of blood, and by the orifice alone appearing.

I remember an operation in which the femoral artery preſented itſelf in this

* Secundum quod ita muſculos ſanguis ab invicem divulſerat ut eadem grumoſo extracto ſtatim obvia nobis fuit arteria, ac ſi arte muſculi ſeparati fuiſſent qui *operandi commoditatem miram præbuerunt.*

condition, and was found and tied with great difficulty. The tourniquet gave way, the blood was flowing out with great impetuoſity, the operator was timid; inſtead of expecting to ſtop the blood only by ſlitting up the tumor rapidly, he expected to check it, by cloſing the ſac, and by preſſing down the lips of the ſmall inciſion which he had juſt made. The ſcene of confuſion during this moment was indeſcribable; but he ſaw that the man's life was in jeopardy, and he at laſt reſolved to ſlit up the tumor; he did ſo, and I clapped the point of my fore-finger upon the ſlit in the artery, which lay firmly imbeded among the muſcles. There had been ſuch manifeſt danger and alarming loſs of blood, that the ſurgeon now reſolved to come at his object the neareſt way; he would not conſent to diſſect round my finger, and clear the artery of the ſurrounding parts; but taking a large needle, he ſtruck it very deep under the artery, through among the muſcular fleſh; and the ligature was ſo exceedingly thick, that it required the aſſiſtant-ſurgeon to pull with all his force before he could compreſs the artery. The moment I lifted my finger, the blood came from below with almoſt the ſame force that it had flowed from above; a ſecond ligature, equally clumſy, was ſtruck under the artery a little lower, and then the hæmorrhagy was perfectly ſuppreſſed, the ſac was cleaned, and the patient laid in bed. This hurried operation, theſe coarſe ligatures, and the deep ſtroke of the needle, though they ſaved the man from immediate loſs of blood, actually endangered his life. The anterior crural nerve, and much muſcular fleſh, were encloſed in the coarſe ſtring that was uſed, and on the eighth or tenth day the artery ulcerated; it burſt out during the night, and the patient was in great danger; the bleeding was prevented by firm compreſſion, and thruſting down a ſponge upon the artery.

Conclusion.—Never delay your operation, that the inoſculations may in the progreſs of the diſeaſe have time to enlarge; for the moſt ſudden operations have been the moſt ſucceſsful. Never wait for the diffuſion of the blood, that it may inſulate the artery, and make it be more eaſily found; when ſuch a rule is propoſed in the following direct terms, I believe it will appear in all its abſurdity; "Would you wait till the blood injected among the cellular ſubſtance, ſeparated thoſe parts which you ought to diſſect?" This delay occaſions an extenſion of the ſac, and a bad condition of the ſore, and endangers ſecondary hæmorrhagy, from eroſion of the inoſculating veſſels.

Never be in a hurry in tying the artery; for as ſoon as you ſee the wound of it, and have got hold of the veſſel, the danger is over. Do not allow yourſelf to ſtrike

your needle coarſely through among the ſurrounding parts, nor tie in the muſcles nor nerve; for the muſcles fade, ſo that the ligature relaxes, and the nerves remain unaffected by the ligature, and continue to hold it faſt, till the artery, after having united, happily inflames, ulcerates, and burſts out anew. This direction, then, of clearing the artery, relates neither to the muſcles nor to the nerves, for the tying the crural nerve can do it not the ſmalleſt harm; ſo clumſy an operation is dangerous only to the artery which is tied in along with it.

### OF THE DIFFICULTY OF COMPRESSING THE GREAT ARTERIES AT THE AXILLA OR GROIN.

In performing our operations on the great arteries of the arm-pit or groin, we muſt truſt nothing to aſſiſtants, nothing to compreſſion of the artery; we muſt do our operation with peculiar boldneſs and ſkill, otherwiſe we ſhall hardly ſave our patient, for in a ſingle moment he is either ſafe or dead.

Camper was the firſt who imagined, that the axillary artery might be compreſſed above the place where the tourniquet can be applied. He demonſtrated the fact; he put the pipe of a ſyringe into the right ſubclavian artery; he threw water along the arteries, and allowed it to flow out, by opening the left axillary artery. He then applied his thumb upon that artery, *below* the clavicle, and found, that by a moderate preſſure he could reſiſt the ſtroke of the ſyringe, and prevent the water flowing out. Mr. Blizzard was the next who ſpoke of this obſervation as of importance, eſpecially to the military ſurgeon. Perhaps there could not be a more patriotic and ſenſible thing, than to give a leſſon on the application and uſe of the tourniquet to the cadets of the Artillery School; and in a diſcourſe on this ſubject, we find Mr. Blizzard giving a ſlight ſketch, by Cipriani, of the manner of applying the compreſs, and of fixing it by preſſing with the thumb *above* the clavicle. The expectation excited by ſo natural a propoſal, ſo well ſupported by anatomy and by experiment, if not by experience, was very great. It was very natural to ſuppoſe, that it muſt be equally eaſy to compreſs the femoral artery at the groin; at laſt it came to be univerſally believed, that the ſurgeon had no reaſon to be afraid; that if he failed to ſuppreſs any hæmorrhagy it muſt be for want of ſkill; that the fixing of the thumb over the artery at the clavicle or groin, was as effectual as the application of the tourniquet itſelf. What good or harm may have been done by this invention, it were preſumption in me to ſay; but this much it is my duty to mention to you, that this method of com-

preſſion is inſecure; that it will be apt to fail you in your greateſt need; that the living circulation, and the ſtruggling of a man under the tortures of an operation, is very different from the experiment made by Camper, with an anatomical ſyringe on a dead body.

I will alſo tell you what I have actually ſeen. In an aneuriſm of the axilla, the ſurgeon truſting to the compreſſion which his aſſiſtant made above the clavicle, opened the tumor, was deluged with blood, and ſaved the patient only by ſtriking a great needle under the artery! he ſaved his patient for the moment, but could not ſave his life; he died of hæmorrhagy in a few days.

A friend of mine appointed myſelf and another ſurgeon to compreſs the artery of the groin, while he performed the operation for femoral aneuriſm. Our cuſhion was well made; our preſſure upon the artery in making the experiment beforehand ſtopped at once the pulſe in the foot and the throbbing of the aneuriſm; we preſſed much more firmly during the operation. I fixed the compreſs with all my force; the other gentleman lay over me, and ſupported my thumbs with his! We had every reaſon to believe that we had a perfect command of the artery; yet at the very firſt ſtroke of the knife, the ſurgeon, having cut into the aneuriſm, was covered with blood, and ſaved his patient with difficulty.

Mr. Allanſon was called to a man who had been blown out at the port-hole of a ſhip by his gun going off while he was ramming home the charge, and found the arm ſo ſhattered, that he was forced to amputate at the ſhoulder joint. In performing this operation, he found that the compreſſion of the ſubclavian artery, even in a man who was lying quite ſtupid from the violence of the exploſion, had not the ſlighteſt effect upon the artery; for having begun his inciſion on the part the moſt diſtant from the axilla, on the outſide of the arm, he found the ſmalleſt branches bleeding profuſely, and his expreſſion is remarkable, "after which an arterial branch diſcharged ſo freely, that we were convinced the preſſure on the ſubclavian artery was not effectually, though judiciouſly made *."

Conclusion.—I will repeat with confidence what I have formerly affirmed, "That it is one thing to ſuppreſs the pulſe in the lower part of the limb, and another thing to ſtop the pulſe in the great artery."—"I have tried in great operations near the trunk of the body to ſtop the blood by preſſure; but though I

* Allanſon, p. 185.

could ſuppreſs the pulſe of the femoral artery with my fore-finger, I could not command its blood with the whole ſtrength of my body *."

I beſeech you, then, do not deceive yourſelves with any ſuch expectation; do not believe that the effect of this preſſure is ſuch as to allow you to perform a quiet deliberate operation; look upon this operation as one where you have to deal with an open artery, and lay your account with being covered with blood the moment you open the ſac. Nor muſt you ever expect to clear the great cavity of blood ſo as to enable you to ſee the bleeding artery; it will, on the contray, fill the cavity with blood faſter than you can bale it out, till the patient breathes his laſt. Operate in ſuch caſes with that rapidity and deciſion which can alone enſure your patient's ſafety; there are occaſions in which the old ſeducing word Caution is full of danger.

* The fact which I have here affirmed is of too much importance for me not to maintain it with more than common earneſtneſs. I affirm then, that "though the throbbing of an aneuriſm, or the pulſe in the "lower part of a limb be quite ſuppreſſed, yet the circulation is not ſtopt; and I entreat the young ſur-"geon never to truſt to any ſuch mark of the compreſſion being effectual." This I have formerly affirmed, in my Anatomy of the Arteries, and will continue to affirm (as Luther ſaid), "though as many devils as there are tiles in Bath were combined againſt me." It is becauſe I affirm this, and becauſe I have ventured to doubt, that compreſſing the carotid arteries will cauſe ſleep, cure convulſions, and reſtore maniacs! that Dr. Parry of Bath has run out upon me the whole length of his chain. He has abuſed me in a Magazine, and, if I am rightly informed, has written lately a book on Angina Pectoris, where I am not ſpared. I have had retention enough not to anſwer Dr. Parry in his Magazine; yet is he not to ſuppoſe, that I will let myſelf be worried peaceably.

Dr. Parry aſks, "Whether the ceaſing of the pulſe in the lower part of the limb be not a certain mark of the circulation being oppreſſed," and, "Whether there be any other mark by which the ſurgeon can know when his tourniquet is effectually applied?" I am confounded at ſuch queſtions coming from a gentleman of Dr. Parry's rank in his profeſſion. The ſurgeon always ſcrews the tourniquet till he ſuppreſſes the pulſe in the lower part of the limb; but he never knows whether he has ſuppreſſed the circulation, whether the artery be effectually compreſſed till he has begun his operation, and then if the arteries of the limb bleed, he ſcrews this tourniquet a little firmer. Once, while I was performing the operation for aneuriſm in the arm, although the tourniquet was ſo applied as to ſuppreſs both the pulſe of the wriſt and that of the aneuriſm, the inſtant the inciſion was made the blood flowed in full ſtream. My aſſiſtant ſcrewed and ſcrewed again; he actually undid the tourniquet in the middle of my operation, took it away, and applied another, and then I finiſhed the operation. This happened in a public hoſpital.

"AM I A DOG THAT YOU ARE COME OUT AGAINST ME TO BEAT ME WITH STAVES."

Dr. Parry has written againſt me a manifeſto of a moſt extraordinary nature. I ſhould be loth to call it a polemical paper; it is a mere exploſion, which, like that of an unſkilful engineer, inſtead of ſcattering the enemy, or overturning their ſtrong towers, blows his own ranks into the air. "And I do love to ſee the engineer hoiſt with his own petard."

This deliberate and careful detail is neceſſary for your underſtanding the various difficulties of this caſe; but the deſcription is not ſuch as to carry you along with the rapidity and hurry of an actual operation, nor does it leave that impreſſion upon your mind which ſhould prepare you for operating.

## THE OPERATION DESCRIBED.

When you are to operate on any great aneuriſm high in the limb, take all the advantage that compreſſion or the tourniquet can give you; but do not truſt to them; do not allow yourſelf to be confounded though the blood ruſh out upon you; be prepared to do your operation with an intrepidity which ſhall make you independent of every aſſiſtance. Firſt draw your knife deliberately and fairly over the tumor, ſo as to lay it open. The ſkin being thus divided, the great livid bag of the aneuriſm, ſurrounded with its ſtrong faſcia, riſes into view. Next puſh your lancet into the ſac, and then do all that remains in your operation

The compliments which Dr. Parry has paid me are ſo unequivocal, and of ſo flattering a kind, that I cannot but recite them. His haſte, his violence, his apprehenſions concerning the effect of my book on this important doctrine of the Compreſſion of the Carotid Arteries, are no ſmall compliments. He acknowledges that I have quoted Coſtæus, Valverdi, Hoffman, Morgagni, Drelincurtius, Rufus Epheſius, ſenſibly, and to good purpoſe, but that I have not ſpelt their names correctly! "That I have ſtudied them all with great attention," but ſtill I have not ſpelt their names correctly! He acknowledges, that he himſelf (though writing about the carotid arteries) has never read one word of Realdus Columbus, Rufus Epheſius, nor any other of thoſe authors whoſe names go rumbling along through his medical manifeſto; but he, at leaſt, ſpells the names correctly! He read that ſtory of the She-Goat firſt in my book; but he ſpells the name Drelincurtius much better than I do! Dr. Parry concludes with accuſing me of confounding him "with the duſt and mould of our College library," which, when one conſiders the polite ſociety which Dr. Parry frequents, was a moſt miſchievous, malicious contrivance.

But I will at once make all the acknowledgments which Dr. Parry requires. I allow him all the advantages excluſively, of his orthographical diſcoveries, and never ſhall correct a proper name in any new edition of my book, without giving his authority on my margin. I believe, upon Dr. Parry's aſſertion, that he never heard one word of the Mounti-Bank, the She-Goat, the Young Man of Piſa, nor of the Aſſyrians, except in the Bible, or in Rollin's Ancient Hiſtory. I declare that I never meant to aſſiliate the ſtory of the She-Goat of Piſa, and the Hyſterical Lady of Bath. I alſo acquit Dr. Parry of the ſlighteſt plagiariſm, becauſe I perceive that the Bibliophobia, now too common a diſeaſe, is fully as prevalent at Bath as elſewhere; and in charity to Dr. Parry's diſeaſe, viz. this Bibliophobia, unwilling to excite his irritability, or riſk another paroxyſm of ſo violent a diſtemper, I promiſe to blow no more of this pulvis Olympicus, or rather Gothic duſt, upon him. In reſpect to the names of Realdus Columbus, Rufus Epheſius, and others, I will bind myſelf to keep the peace, and mention them no more; for I am ſenſible,

with great boldneſs; run your biſtory upwards and downwards ſo as to ſlit up the tumor quickly; plunge your hand ſuddenly down towards the bottom; turn out the great clots of blood with your hand and fingers, till having reached the bottom entirely, you begin to feel the warm jet of blood, and directed by that, clap your finger upon the wounded point of the artery! as it is but a point, your finger will cover it fairly, and your feeling the beating of the artery will aſſure you that all is ſafe.

Now the bleeding, confuſion and fainting are over in a moment; the operator breathes, and the aſſiſtants are compoſed; and all the operation goes on eaſily and ſafely. The artery is effectually commanded by this preſſure with the finger; but the firſt movement in ſuch an operation, viz. the act of ſtopping the blood,

that if he has had an averſion all his lifetime from the individuals of that party, he muſt have now a mortal hatred at the whole generation, and all their aiders and abettors. He very ingenuouſly relates the manner in which he was ſeized with his firſt paroxyſm; it is indeed pitiful, wondrous pitiful. One unhappy day he ſtepped into a bookſeller's ſhop in Bath, and there having ſeen my ſecond volume of Anatomy, returned home in a violent paroxyſm; and the recollections of the forenoon's accident working like a poiſon, he at laſt began to rave loudly about Realdus Columbus, and Rufus Epheſius, as heretofore the great critic John Dennis raved about one Cator—Cator. Alas! could not Dr. Parry, if he has really any faith in his own doctrine, have ſat quietly down and applied his thumbs ſteadily and ſkilfully to his carotid arteries?

I would very willingly and heartily congratulate Dr. Parry on his diſcovery, were it not that diſcoveries are now ſhowered down upon every blockhead; and the diſtinction is of ſuch a kind, that, in my opinion, it is hardly Phariſaical to ſay, I thank God I am not as other men are, a phyſiologiſt, a diſcoverer, or even as this ———. But I grieve for Dr. Parry when I reflect on the probable fate of this doctrine, ſo different from what he himſelf imagines. He ſpeaks of it as a diſcovery for which he will be envied by the whole world, by all generations, preſent and to come. "Excuſe me (ſays Dr. Parry), excuſe me thus dwelling on myſelf; I am compelled to do ſo, leſt hereafter, when my method of cure (viz. by clapping, not his fore finger, obſerve now, but his thumbs, upon the carotid arteries!) when my method in thoſe diſeaſes (hyſterics, convulſions, headache and mania, and bleedings from the noſe!) when my method of cure (viz. *compreſſing for the hyſterics!*) comes into general uſe, as certainly it will do! ſome future Mr. Bell, envious of a diſcovery which chance has allotted to another, ſhall," &c. No, no, no, I am not envious, and if I were, this is one of the diſcoveries which I ſhould think it a ſin to ſteal; for I perceive ſuch a theft would break the owner's heart and do the pilferer little good. It is one of thoſe diſcoveries which will ſtick to the author. It is now public, it is more ſecure than that of the Circulation, or of the Lymphatic ſyſtem, for Harvey and Hunter were in great danger of having their diſcoveries ſtolen from them; but Dr. Parry I will venture to enſure for a trifle.

When the celebrated Dr. Hunter mentioned in his claſs that a certain northern diſcoverer had diſcovered and made engravings (which, by the by, are ſtill extant) of nerves in lead, in tin, in finger nails, and in the hairs of his own wig! the Doctor proteſted in the following terms: "Gentlemen, I have many

of getting at the artery, is all boldneſs, and nothing of caution; no danger is to be apprehended, but that of ſuffering your patient to loſe blood.

Being now compoſed, you take time to arrange every thing for the next ſtep of your operation, you feel the beating of the artery with the point of your finger, perhaps you raiſe the point of your finger for a moment, to diſcover whether the preſſure of your aſſiſtants, at the groin or clavicle, commands the artery: If ſo, you lift your finger, and examine round the artery; if not, you keep your finger ſteady, make the aſſiſtants clean the ſac round the artery; then, if the artery lies fair and free in the bottom of the cavity, you proceed to tie it; but if not, you muſt diſſect round the artery, until you ſee it free from other parts, and have it ſo inſulated that you may put your ligature eaſily under it, unleſs, indeed, the recollection of ſome great trunk being near the wounded artery (as of the profunda, when you are tying the femoral artery), ſhould ſtop you. But yet

times laid claims to ſome of this profeſſor's diſcoveries, but this diſcovery is ſo comprehenſive, ſo ſurpriſing—! This! I proteſt, is none of my diſcoveries, no, no, no."

I will quote no more of Dr. Parry's paper, but refer my reader to the Monthly Magazine for this precious literary morceau; it is a ſingular ſpecimen of the urbanity and bien-ſceance of a Bath phyſician. Living in atmoſphere of hyſterics, ſpleen, and hypochondriaciſm, he takes up the compariſion which is moſt at hand, likens me "to a fine lady pouting, and laughing, and crying in hyſteric fits!" calls me anatomiſt, and many other bad names! and as if to be an anatomiſt were to be an idiot, he compares me with Jedidiah Buxton of *notorious memory*.

In return, I will tell Dr. Parry a thing which will very much ſurpriſe him. I have a ſincere reſpect for him, not on account of his politeneſs, his moderation, his polemical talents, his orthography, or his learning, but becauſe I am aſſured by his friends, that he is a worthy and honourable man, highly and juſtly reſpected in his profeſſion, and zealous for the improvement of it. I believe him to be a man of excellent abilities, and though in this point I cannot agree with him, I am ſorry that I have offended him. Yet I fear that Dr. Parry's own conduct in this affair will hardly pleaſe even himſelf upon reflection. I declare upon my honour, that I ſhould have been happy, had Dr. Parry complained politely, to have torn out any offenſive paragraph, but he has attacked me in ſuch a manner! "ferveſcit ſanguis, et ira ſcintillant oculi, diciſque faciſque, quod ipſe non ſani eſſe hominis, non ſanus juret oreſtes," when I thought I was but repeating an amuſing ſtory known to all the world (except Dr. Parry) about the She-Goat of Piſa, and the Young Men of Aſſyria, behold Dr. Parry comes thundering and foaming upon me, exclaiming, againſt what? Why againſt my intemperance!—Surely Dr. Parry is of the family of the abſolutes, and will allow nobody to be in a paſſion except himſelf. "Damn you young raſcal (ſays this abſolute) can't you be calm like me? can't you be cool Sir, like me, do you ever ſee me in a paſſion? none of your grinning jackanapes;" but Dr. Parry ſhould alſo remember that I may perhaps have a little of the abſolute blood in me, and that all who claim of kin to the family of the abſolutes have the ſame licenſe. "Never mind Jack, why its Jack's way and its my way, and its all our ways,—it runs in the blood of the abſolutes."

"Excuſe me thus dwelling on myſelf."

the nearneſs of any great artery or nerve is an argument as ſtrong againſt your diving with the needle to catch the wounded artery, as againſt your diſſecting with the knife. Since, therefore, the diſſection is done with your eyes open, and you can ſee and feel before the point of your knife, rather diſſect, or ſometimes tear the artery naked with the point of your fingers, tie its open mouth, if cut acroſs, as fairly as in an amputated ſtump; or if it be punctured only with the point of a knife or ſword, put two ligatures round it, one above and one below the wound, and put them neatly and fairly round the artery, and then cut the artery acroſs betwixt the two.

With reſpect to the ſize and form of your ligatures, do not allow in yourſelf the ſlaviſh and abſurd fear of cutting arteries acroſs with your threads. It makes ſurgeons uſe clumſy ligatures in amputation, often ineffectual; and in aneuriſms of the thigh or ſhoulder, ſuch tapes are uſed as it would be impoſſible to draw tight even round the aorta, though that could become the ſubject of operation; the circle of the knot made by ſuch a ligature is often wider than the diameter of the arterial trunk round which it is tied! Surgeons have complained that they could not draw their tapes tight enough round the femoral artery, even with the whole ſtrength of their hands *.

Let your ligature, then, be made of three or four threads well waxed, tied not with the ſurgeon's knot, but with one ſingle knot moderately drawn, ſecured with a ſecond ſingle knot, the threads left hanging from one corner of the wound. It can hardly be neceſſary to adviſe, that after ſuch operations upon the femoral artery, tourniquets ſhould be ſtill kept round the limb, to guard againſt thoſe accidents which have ſo often happened, and will, we fear, continue to happen, in the hands of the moſt famous ſurgeons.

But if it chance that the parts are ſo maſſed with inflammation, ſo diſordered by the driving of the blood in old aneuriſms, or perhaps ſo hurt, as to be almoſt in a ſtate of gangrene; if the ſurgeon cannot by any means get a fair view of the artery, and that his patient be loſing blood, pouring from ſome great trunk, then he muſt ſtrike his needle at random, in order to come at his object the neareſt way; and the only ſatisfaction that he can have, or the only proof of his having tied the artery at all, will be the ſudden ſtopping of the blood when he draws

* "Auſſi at on vue des occaſions ou il n'a pas ete poſſible de ſe rendre maitre du ſang. Dans un operation d'aneuriſm de l'artere poplitée, un chirurgien tres exercé aux operations chirurgicales, ne peut purvenir a ferrer ſufficemment l'artere et l'on fut obligé, *d'avoir recourſe a l'amputation.*" DUSCHAMPS.

his ligature. In circumſtances like theſe, the greateſt ſurgeons (even Mr. Pott himſelf), have been accuſed of having miſſed the artery; the artery at all events, in ſuch a caſe, is irregularly and inſecurely tied, the attendants that are appointed muſt be ſkilful, and muſt be intereſted; both friends and ſurgeons ſhould watch over the patient's life moſt faithfully, for ſucceſſive bleedings will happen ſometimes from ſo ſlight an accident as a ſudden turn, or unwary motion in his bed during the night.

Of one thing I am chiefly afraid, namely, that my deſcription may ſeem overcharged; that I may appear to have exaggerated the difficulties of an operation like this; that it may be thought that an accident requiring all theſe precautions, and this plunging down of the hand, can hardly occur. Therefore I ſubmit to your conſideration the following caſe, and I dare ſay, you will find that it needs no apology; but that as it is new and intereſting, it deſerves its place.

"A poor man, who was by trade a leech-catcher, fell as he was ſtepping out of a boat, and the long and pointed ſciſſars which are uſed in his buſineſs being in his pocket, pierced his hip exactly over the place of the ſciatic notch, where the great iliac artery comes out from the pelvis. The artery was ſtruck with the point of the ſciſſars, it bled furiouſly, the patient fainted; and in ſo narrow and deep a wound, the ſurgeon, when he came, found little difficulty in ſtopping it up, and leſs difficulty ſtill in making it heal. The outward wound was cured; the great tumor ſoon formed; and the man travelled up from the north country, where the accident had befallen him, and in ſix weeks after arrived in our hoſpital here with a prodigious tumor of the hip, his thigh rigidly contracted, the ham bended, the whole leg ſhrunk, cold and uſeleſs, as if it had been an aneuriſm rather of the artery on the fore part of the thigh.

"The tumor was of a prodigious ſize, and by that very circumſtance of its being one of the greateſt aneuriſms, it had loſt all the characteriſtics of aneuriſm. There was no pulſation, no retroceſſion of the blood when the tumor was preſſed upon; there was nothing elſe peculiar in the tumor except this, that the great and ſudden diſtenſion occaſioned great pain; and from the continual pain, and lameneſs, and from having ſome hopes of a cure, he was ready to ſubmit to any thing, beſeeching us to operate.

"There was little doubt of this being a great aneuriſm, but there was a poſſibility of its being a vaſt abſceſs; and it was reſolved in conſultation that the patient ſhould be carried into the operation room; that a ſmall inciſion ſhould

be made; that the ſkin being cut, the bag itſelf ſhould be juſt touched with the point of a lancet; if found to contain matter, it ſhould be fully opened; but if blood, then it was to be conſidered as an aneuriſm of ſo particular a kind, as to entitle us to call for a full conſultation.

"I made an inciſion two inches and a half in length; the great faſcia of the hip appeared blue, and very ſtrong, forming the coat of the tumor, and under that were ſeen the big fibres of the great glutæus muſcle. The knife was ſtruck into it, and large clots of very firm black blood rolled out; for ſuch was the tenſeneſs of the tumor, that it began to emit the clots in this way, the moment it was punctured. There was one thing further deſirable, that before we put the patient to bed, we ſhould underſtand the caſe ſo far as to be able to report to the conſultation, whether the artery was abſolutely open, and whether it was the great artery of the hip. I continued therefore (knowing that the opening I had made could be covered with the point of the thumb) to pull out a few more clots, till the warm and florid blood began to flow; I then puſhed in a tent-like compreſs into the ſmall wound of the tumor (viz. of the faſcia), laid a broad compreſs over the outward wound, and put the patient to bed, with one of the pupils holding the hand upon his hip.

"This was done at one o'clock, and at four the conſultation met, and the operation was performed. And in my notes, I find two ſteps of the operation chiefly marked:—Firſt, That upon our opening the tumor fully with an inciſion of eight inches long, and turning out the great clots, the blood was thrown out with a whiſhing noiſe, and with ſuch impetus, that the aſſiſtants were covered with it, and in a moment twenty hands were about the tumor, and the bag was filled with ſponges, and cloths of all kinds, which had no better effect than the cloths which, in any accident, the friends in great confuſion wrap round a wounded arm; for though the blood was no longer thrown in a full ſtream, nor in jets, it was ſeen riſing through the edges of the inciſion; it floated by the ſides of the cloths, which were preſſed down by the hands of the aſſiſtants. But we knew alſo by a more alarming ſign that the blood continued to flow, for the man, who was at firſt lying not flat, but ſupporting himſelf on his elbows, fell down, his arms fell lifeleſs and without pulſe over the ſide of the table, his head hung down, his face was livid, he uttered two or three heavy groans, and we believed him dead.

Secondly, Seeing, in this critical moment, that if he was to be ſaved, it was to be only by a ſudden ſtroke, I ran the biſtory upwards and downwards, and at

once made my inciſion two foot in length: I thruſt my hand down to the bottom of the tumor, turned off the great ſponge which was over the artery, felt the warm jet of blood, put the point of my finger upon the mouth of the artery; then I felt diſtinctly its pulſe, and then only was I aſſured that the man was ſtill alive. The aſſiſtants laid aſide the edges of this prodigious ſac, and ſought out the ſeveral ſmaller ſponges which had been thruſt in, and the ſac being deliberately cleaned, and its edges held aſide, I kept the fore-finger of my left hand ſteady upon the artery, paſſed one of the largeſt needles round under my fore finger, ſo as to ſurround the artery: one of my friends tied the ligature, and then upon lifting the point of my finger, it was diſtinctly ſeen, that it was the poſterior iliac artery,—that the artery had been cut fairly acroſs, and had bled with open mouth—that it was cut and tied exactly where it turns over the bone: and although the extremities were cold, the face of a leaden colour, and the man had ceaſed to groan, and lay as dead; though the faint pulſation could not be felt through the ſkin, in any part of the body; we ſaw the artery beating ſo ſtrongly under my finger, that we were aſſured of our patient's ſafety; however, he was ſo low, that after laying down the ſides of the ſac, and putting bandages round his body to keep all firm, we were obliged to have a bed brought in, and having given him ſome cordials, we left him to ſleep in the great operation room, attended by the pupils and by nurſes. He paſſed his urine and fæces involuntarily for ſome days, and was long in recovering his voice.

He was cured of this great wound in leſs than ſeven months, although his cure was protracted by the foul ſuppuration of ſuch a ſac, and by the exfoliation of the ilium and ſacrum, which ſpoiled, not ſo much from their having been laid bare by the laſt ſudden ſtroke of the knife, as by the aneuriſmal blood having preſſed upon them; the exfoliations were very large, and the ſacrum eſpecially continued exfoliating to the very day on which the wound cloſed.

I do not know whether this man have recovered entirely, for he left the houſe lame, from the contractions of the hip and ham, and walking by the help of a ſtick; but however, he thought himſelf fit to undertake his profeſſion, and went to England with that deſign *.

This caſe will impreſs the directions already given upon your mind, it is ſingu-

* Dr. Farquharſon, who ſucceeded me in the charge of the hoſpital, has juſt informed me, of this man having called upon him after his return from England, walking ſtoutly, and in good health.

lar and worthy of its place, ſince the aneuriſm was one of the largeſt ever known, containing not leſs than eight pounds of blood. It is alſo an inſtance of one of the leaſt probable of all wounds, viz. a ſmall ſharp point touching one of the deepeſt arteries, and one of the largeſt; and wounding it at the very point, where it comes out from the trunk of the body; and where it cannot be compreſſed; for though my friend Dr. Farquharſon, tried to make ſome impreſſion upon the deſcending aorta, by preſſing down his fiſt into the belly, ſo as almoſt to touch the ſpine, ſtill there was a deluge of blood upon cutting up the tumor, and the artery beat ſtrongly under my finger. But if any thing can increaſe your intereſt in this caſe, it muſt be ſuch an accident as that which I am now going to relate.

——— M'Donald, a very ſtout young man, by trade a ſhoemaker, threw himſelf careleſsly down on the lid of a box, where a great nail ſticking up, ran into his hip. For one day he concealed the accident which had happened to him, but next day the hip was greatly ſwelled and very painful; the wound healed, the ſwelling increaſed for ſome time, and was judged to be a deep ſeated inflammation; and when at laſt the fluctuation was diſtinctly felt near the ſurface, and a little below the ſcar made by the nail, it was ſuppoſed to be the fluctuation of matter. It was in truth the fluctuation of blood! for the ſurgeon punctured the moſt prominent and ſofteſt part of the tumor, watery blood iſſued, and was ſtopped with great difficulty, but at laſt it was ſtopped. The integuments were by this time in a very dangerous condition, inclined to ſlough and give way; the original wound actually burſt open, and, as well as the lancet wound, diſcharged blood; both wounds were now ſecured with compreſſes and a firm plaſter of roſin.

It was in this dangerous moment that my friend Dr. Jeffrey was called to viſit this patient. The wound was preciſely oppoſite to the glutæal artery, at the place where it iſſues from the pelvis. The tumor extended but a little way above the point where the nail had run into the hip, but it was of conſiderable breadth, and it deſcended along the buttock ſo as to occupy the upper and back part of the thigh. From the extent of the tumor, the blood which it diſcharged upon being opened, and the difficulty of ſtemming the torrent of blood, there could be little doubt of the nail having run into the glutæal artery.

And now enſued that agitating and turbulent ſcene which is occaſioned by the officiouſneſs of friends. The ſurgeon was abſurdly blamed, as if it were poſſible

for a lancet to reach the glutæal artery through all the thickneſs of the glutæal muſcles. This aneuriſm muſt have been of vaſt extent at the time of the ſurgeon touching it with the lancet, it diſtended chiefly the lower part of the hip and top of the thigh, removing the integuments, as Dr. Jeffrey very naturally obſerves, at leaſt to the diſtance of ſix or eight inches from the place where the great veſſels lie in the ſciatic notch. Theſe idle reflections, which no ſurgeon could have given any countenance to, entirely occupied the minds of the friends in this moment of diſſatisfaction; Dr. Jeffrey's opinion was rejected, and other Gentlemen were called into conſultation. Dr. Jeffrey's opinion was at laſt aſſented to, and the relations of the patient began to repent of the harſh expreſſions they had uſed. They now conſented to have the tumor laid open and the artery ſought for, but while matters were preparing for this important operation, the young man having occaſion to go to ſtool, roſe from his bed during the night, the wounds burſt open, and in a few moments he expired.

Dissection.—An injection-pipe was put into the iliaca communis within the pelvis, and the femoral artery was tied under Paupart's ligament. The whole baſin of the aneuriſm was laid open by a long inciſion, the coagulated blood carefully removed, and tepid water thrown into the artery. The jet of water was ſeen to iſſue from a veſſel that ſeemed to ſtand out with a trumpet-like mouth, from under the haunch bone near the ſciatic notch. Here then a phenomenon preſents itſelf, which the ſurgeon in operating upon ſuch an aneuriſm ſhould not forget, for he might tie what only appeared to be the arterial mouth! This was not the mouth of the artery, it was a clot of very firm blood, which, coagulating among the cellular ſubſtance which ſurrounds the artery, projected much beyond the mouth of it, and might have deceived the ſurgeon.

This firm coagulum, which repreſented the mouth of the artery, being bruſhed off, it was found that the wound of the artery had in truth nothing of this appearance; the artery was not cut entirely acroſs as in Stewart's caſe where it was wounded with ſciſſars, but was merely punctured with the point of the nail; the artery was the great glutæal or poſterior iliac, it was wounded within half an inch of the ſciatic notch, and the hole was round.

"The friends (ſays Dr. Jeffrey) who ſaw the immenſe quantity of coagulated blood which lay betwixt this wounded artery and the ſkin, were ſatisfied of the innocence of the ſurgeon, a man of unqueſtionable ſkill in his profeſſion. The medical gentlemen were ſatisfied, that had the real nature of the accident been

diſcovered in time; had the relations agreed when the opinions of the medical gentlemen were reconciled; had they conſented to the operation when it was propoſed; had they not obliged me to loſe the favourable moment in demonſtrating blood-veſſel preparations to them, and explaining the nature of the accident! the life of this young man might perhaps have been ſaved, for betwixt the verge of the ſciatic notch and the wound of the artery, there was abundance of room for ſtriking the needle under the wounded part."

## RULES OF PRACTICE.

After theſe deſcriptions, a few rules ſhould be ſufficient, yet I will venture to repeat ſuch points as I think may be of particular ſervice.

1ſt, In great aneuriſms of the arm or thigh, when the tourniquet can be applied, do your operation deliberately, ſteadily, ſlowly, but do not needleſsly prolong your patient's ſuffering. Cut the ſkin nicely, open the ſac freely, diſſect your artery very clean, if it be maſſed along with the other parts by adheſion; and tie it clear of the nerve, and paſs your ligature with a blunt needle or crooked probe; for whenever you are reduced to the neceſſity of uſing the ſharp needles, your patient is in danger. Tie your artery with moderate firmneſs, tie it in two places (for on ſeveral occaſions the retrograde blood has flowed out even in the time of the operation), clean the ſac, look now attentively to your two ligatures, and if you ſee the upper one moving according to the pulſation of the artery, all is right. Finally, if you approve of my reaſoning, cut the artery acroſs in the middle betwixt the ligatures.

2d, When the tourniquet cannot be applied, truſt nothing to the compreſſion at the axilla or groin, for though it is ſometimes effectual it often fails, and lives have been endangered by a ſurgeon's entering on ſuch operations without being prepared for the worſt. You find by making the experiment on your own arm that you can ſtop the pulſe; you think yourſelf able to ſecure the patient, but it is, I proteſt, a mere deception, for the circulation is not ſuppreſſed when the pulſe ceaſes, or the pulſation of the tumor prevented.

3d, While I counſel you to truſt nothing to compreſſion, I ſtill adviſe you to take every aſſiſtance; let your aſſiſtant try to compreſs the artery, but do not lay your account with performing a cool deliberate operation, expect rather a daſh of blood at the firſt ſtroke you make into the ſac, and confuſion and alarm

of every kind. Compoſe your mind for ſuch a ſcene, bend up each corporal agent to this attempt; expect ſafety for your patient from nothing but your own daring operation; be reſolute, bold, and rapid, but let this boldneſs be the reſult of ſerious deliberation, and earneſt conſultation with your friends. And in what does this rapidity conſiſt? Is it a dangerous ſtroke that you are to make? No ſurely! the rapid movement is merely ſlitting up ſuddenly the half putrid and tendinous ſac, and turning out the clots of blood with your fingers, while the artery, nerve, and all the important parts lie ſafe at the bottom of the tumor. You are to truſt much to your acquaintance with the parts, therefore make ſure of your knowledge of the artery that is actually wounded; return to your books, drawings, and preparations; hold conſultations with your friends; loſe no opportunity of making up your mind beforehand; the more you reaſon upon the caſe, and revolve the poſſible dangers, the greater will be your proſpect of ſuſtaining yourſelf with becoming reſolution in the moment of operation.

4th, Do not piddle at this operation as if it were ſome ordinary buſineſs, nor look timorouſly into the ſac, ſoaking up with cloths and ſponges that blood which you ſhould not allow to flow; hiding the danger in this way, is but increaſing it. Meet the danger like a bold and well inſtructed ſurgeon, do not be afraid to ſee the mouth of a wounded femoral artery, look your enemy in the face! cut the ſkin as ſlowly as you will, but ſlit up the ſac rapidly, ſpread it wide, look down to the bottom, be directed by feeling the warm blood upon your finger, or by ſeeing the jet of florid blood! for the moment you ſee the artery all danger is over *.

5th, When in great wounds, as of the axilla or groin, or when in burſting aneuriſms, the hæmorrhagy has been profuſe, and the patient is faint and low, and almoſt dead; do not haſten, as a vulgar perſon would do, with heat or cordials, to revive your patient from that fainting which has ſaved many lives! Never rouſe the circulation till you are ſure you can command the artery.

If I have been guilty of ſome repetitions I hope they are uſeful repetitions. They are deſigned not for your amuſement but for your inſtruction. As a teacher I venture to give you one admonition, which I am ſure you will take in good part; think of the momentous operation which I am deſcribing, and let that

* The firſt word in this paragraph requires an apology, it is a mean and homely expreſſion; I might indeed ſave myſelf from trivial criticiſm, but I ſhould do my reader an injuſtice were I to ſubſtitute for it the beſt ſounding word in our language.

be my apology for preſſing upon you this piece of advice. Do not neglect the ſtudy of anatomy; but make yourſelf perfect in it before you enter upon any important part of your profeſſion, and eſpecially before you meddle with aneuriſms, where the patient's life is in ſuch manifeſt danger! before you enter into the military ſervice, where much the greater number of thoſe who periſh in the field die from wounds of the great arteries! before you begin to perform great operations in ſurgery, where hæmorrhagy is the chief cauſe of confuſion, and the unneceſſary wounding of arteries the greateſt error. Our old ſurgeon, Turner, after very awkwardly comparing the ſearching for an artery and tying it, with the ſeeking out a piece of cord from a bundle and tying it with two ſmaller threads, concludes his diſcourſe in the following terms: "Excuſe me, Gentlemen, you know doubtleſs what I mean by this rude ſimile, that the UNDERTAKER OUGHT TO BE A DEXTEROUS KNIVES-MAN OR ANATOMIST, both Myotomiſt and Angiotomiſt, not only expert in muſcular diſſection, but in the ſituation or courſe of the great blood veſſels alſo, the ſtudy and practice whereof I ſo earneſtly preſſed upon you in my laſt ſection, ſo that I ſhall ſhut this perhaps overlengthened one with the ſame advice."

# DISCOURSE X.

## OF THE OBLIQUE WOUNDS OF ARTERIES.

Perhaps I might be juſtified in ſaying, that the wounds of the arteries are more important in proportion as the artery is ſmall. But of this I am well aſſured, that where you are not forced to operate by the great ſize and manifeſt danger of the aneuriſm, there is much ſteadineſs and good ſenſe required in reſolving upon an operation, which to an ignorant man ſeems almoſt unneceſſary! And there is more merit in diſſecting and tying a ſmall artery which lies buried under muſcles, cellular ſubſtance, and coagulated blood, than in finding the femoral artery at the bottom of an aneuriſm formed by a large and regular ſac.

When an artery like that of the hip or thigh is wounded, it forms an incontroulable aneuriſm. Such an artery drives every thing before it, forms a large ſac, diſtends more and more till it is in danger of burſting, and if allowed to burſt proves fatal.

But when ſmaller arteries like thoſe of the fore arm or leg are wounded under the bellies of the muſcles, the aneuriſm is more irregular, the operation very difcult, and the dangers quite of another kind. The blood is injected ſlowly among the cellular ſubſtance and under the muſcles; no ſac is formed; the blood is not collected but diffuſed; the pulſation is ſlight or there is none; the limb is ſwelled and hard, the ſkin black as in a mortification, the blood burſts out from time to time. It is conſidered only as a hæmorrhagy, while it is in truth a diffuſed aneuriſm; the patient, by repeated loſs of blood, is reduced to extreme weakneſs, and the limb gorged with blood, and with its parts ſo inſulated and disjoined from each other, by the extravaſation, often falls into gangrene. Theſe are the uſual conſequences of ſuch a wound! if the patient eſcape it is after long continued ſuppurations, foul ſinuſes, and a great deſtruction of the limb.

There are alſo certain parts of the body where the ſmalleſt arteries produce the ſame conſequences. The axilla, for example, is a very large cavity filled with the

looſeſt cellular ſubſtance, fit for lodging the veſſels and glands. The external thoracic or pectoral artery, which if it lay along the wriſt or the temple, and were wounded there, could not do the ſmalleſt harm, is capable of forcing the cellular ſubſtance of the axilla; it has as much effect on the looſe cellular ſubſtance of the axilla, as the femoral artery has on the firm cellular ſubſtance of the thigh; it has often filled the axilla completely with blood, forming a very large and dangerous aneuriſm.

Theſe ſubjects I propoſe now to explain to you, and ſhall add a few rules for ſuppreſſing the bleeding from open wounds where the arteries lie quite expoſed. The radial, ulnar, and tibial arteries, in the lower parts of the limbs lie ſo ſuperficial, that their bleedings ought to be eaſily ſuppreſſed; awkward and imperfect operations are diſaſtrous only from the ſucceſſive hæmorrhages, and not from the important ſize of theſe arteries.

The point of practice which I have firſt of all to repreſent to you, is the difficulty of finding an artery when it is wounded obliquely by the ſlanting ſtab of a knife or ſword, or by the oblique courſe of a ball. This difficulty is greater than it will be eaſy for you to imagine; I ſhall ſpeak the more fully upon this ſubject, in order to explain to you the nature of theſe difficulties, and to convince you of the natural dangers of ſuch a caſe; but I wiſh to impreſs ſtrongly upon your minds the ſtill greater dangers of ignorance, or timidity; the folly of making inciſions too ſmall for the occaſion, which, notwithſtanding, are ſuch as to produce all the pain of the greateſt inciſion, without accompliſhing the purpoſe for which they were deſigned.

What caſe is more dangerous, or what operation more important than this which we perform upon a wounded artery? and where is the other great operation, in which our firſt inciſions are done in this timorous way? I ſhould, I am ſure, think myſelf much better entitled to cut up the axilla, to get at a wounded artery, than to cut through the perineum and bladder, to extract a ſtone. The one indeed is the more terrible diſeaſe, but the other, as you will ſee by the following example, is a buſineſs of immediate life or death.

Before I enter upon the deſcription of a caſe which I mean to ſtate to you, I feel the neceſſity of explaining what I think is the import of the caſe; and, in a few words, the matter is this:—Sometimes, an artery being ſtruck with the point of a knife or ſword, is merely punctured, and not cut acroſs. The obliquity of ſuch a wound, acts like a valve upon the artery, there is but little blood

poured out under the ſkin, and no remarkable tumor is formed: Now the ſurgeon ſatisfied from the ſudden and violent guſh of blood, that an artery is opened, feels himſelf called upon to look for the bleeding veſſel, and to lay open the arm or thigh; but preſuming too far upon his own knowledge of the arteries, he makes a new inciſion along the courſe of the artery, *neglecting the more eaſy and obvious way of ſeeking for the wound in the artery, by enlarging the natural wound.* When, for example, the artery being wounded from the outſide, he ventures to ſeek for it by a new inciſion from within! He gets to that ſide of the artery, where no wound is; his attempts to make it bleed, only preſs the ſlit-like wound of the artery ſo much the more firmly down againſt the fleſh below! He cannot ſee the wound, nor even believe that there is one; he tries to make it bleed, but he fails; ſtill, he ſees the main trunk of the artery lying in the bottom of the wound, beating ſtrongly under his finger, apparently entire, and he cannot yet believe that there is any wound in it. He continues his work, but can by no contrivance force the artery to bleed; he can never ſee where the wound in the great trunk is, nor be ſatisfied whether or not the blood flows from ſome ſmaller artery; but no ſooner does he leave his patient than it burſts out furiouſly, and bleeds from time to time, till the patient expires. If I can produce one ſuch caſe, it will be at once a leſſon and warning to you; and the warning will be the more impreſſive, in proportion to the reſpectable rank of the ſurgeon, who may have been guilty of ſuch a miſtake.

A young man of 25 years of age, in parrying a blow, aimed with a ſharp pointed knife, at his breaſt, received it in the middle of his arm. The knife, entered at the outer edge of the biceps, and touched the Brachial Artery; he ſtaggered forwards a few paces, and then, fainting with the loſs of blood, fell down. Unfortunately there was no one preſent but a young pupil in ſurgery, ſo ignorant that he bled him in the other arm, and tied up the wounded one, merely laying a compreſs upon the wound.

Till the 8th day, there was no farther alarm, when a very ſlight cough brought on a violent bleeding, then fortunately, a ſurgeon was called, who really underſtood the dangerous nature of the caſe, and he, in his turn, called Mr. Duſchamps, upon whom the care of the patient devolved; he found the arm enormouſly ſwelled, from the armpit to the elbow, and covered with ecchymoſis down to the wriſt.

" At nine in the morning, ſays Mr. Duſchamps, I began the operation, the

patient being ſeated, and every thing prepared. But behold, when I introduced my probe into the wound, it paſſed ſo far upwards towards the axilla, that I feared the wound was very high, perhaps in the Axillary Artery itſelf; ſo that inſtead of the operation for aneuriſm, I might find myſelf obliged to amputate at the ſhoulder joint. I begged to have another ſurgeon joined in conſultation, and accordingly Mr. Sabbatier met me in the evening at five o'clock. The operation was performed in the following manner :"

Mr. Duſchamps made an inciſion, not by enlarging the natural wound, but by a new cut along the inſide of the arm, in the tract of the humeral artery, full ſix inches long, extending downwards from the tendon of the pectoral muſcle along the arm ; and by this inciſion, he penetrated into the aneuriſmal bag, and cleanſed it thoroughly of coagulated blood. Mr. Duſchamps and his aſſiſtants then ſuſpending the compreſſion under the clavicle, hoped to ſee the wound, or at leaſt to be directed to it by the bleeding ; but though they examined and wrought a full quarter of an hour, and although they ſaw and felt the main trunk of the artery beating under their fingers, they could not by any endeavours make it diſcharge one drop of blood ; ſo that one of them ventured to ſay, he thought it could not be the main artery that was wounded ; while others agreed, that nothing but a wound of the main artery could account for the firſt loſs of blood.

In this ſtate of uncertainty, it was reſolved to lay an occaſional ligature under the artery, which at any time might be uſed, if neceſſary, while the artery itſelf ſhould be ſubdued by compreſſion alone with agaric and dry lint *. Mr. Duſchamps, firſt, enlarged a little the wound of the knife, and introduced his finger

* He is confuſed to the laſt degree in his account of the caſe, ſo that one cannot gueſs, whether he did or did not ſtrike this occaſional ligature through the ſkin and fleſh, as the older ſurgeons did; as Mr. O'Halleran was accuſtomed to do on difficult occaſions, or as Mr. White did lately in Captain Mounſey's caſe. But what makes one ſuſpect that he did ſo is this, that he makes the following contraſt of the two parts of his operation : We reſolved, ſays Mr. Duſchamps, to uſe on the *inſide* of the *wound*, a compreſſion extending along the courſe of the artery ; but beforehand, to put in an occaſional ligature, " Dans cette incertitude, nous reſolumes d'employer dans l'interieur de la plaie une compreſſion ſur le trajet de l'artere, et prealablement de placer une ligature d'attente." And next, he ſays, " I paſſed this ligature half an inch above the place, to which the point of my finger reached within the wound ;" by which it is plain, that he paſſed this ligature either through the ſkin, or through the wound he had made on the inſide of the arm, and not through the wound made with the knife, which he had now dilated no further than to admit his finger, and he introduced his finger for no other purpoſe than to ſerve as a director. " Je pris le parti de choiſir ce lieu pour celui de la ligature, que je fis cinq à ſix lignes au-deſſus de l'endroit ou repondoit l'extremité de mon doigt."

into it, puſhing it upwards towards the axilla; and by this diſſection, he applied his occaſional ligature half an inch higher than the point of his finger.

Secondly, He covered all the courſe of the artery, within the wound, with agaric and lint, ſecured by an eighteen tailed bandage; but ſo ſlightly bound that it did not ſuppreſs the pulſe.

At four in the morning the blood burſt out, but it ſtopped again of its own accord; it burſt out twice the next day, and in like manner ſtopped again. On the third day it burſt out yet again; but the hæmorrhage which came on upon the fourth morning was frightful indeed; the bed was ſoaked through and through with blood, which, from the foulneſs of the dreſſings, had contracted a horrible ſmell. At ten in the morning I reached my patient, ſays Mr. Duſchamps, and undid the bandages. The agaric and lint were left in the inciſions which I had made with the knife; the lint was drawn out of the original wound; there was now no bleeding, and the patient was dreſſed as before; but again at mid-day the blood burſt out with amazing force, and again it was ſtopped by the attending pupil. Mr. Duſchamps now undid the dreſſings entirely, and cleaned the parts, hoping to ſee the wound of the artery, or at leaſt the jet of blood, but not one drop flowed. "With a patient ſo exhauſted," ſays Mr. Duſchamps, "I durſt no longer truſt to compreſſion; I now reſolved to draw the occaſional ligature, and the inſtant that it was drawn the blood was thrown out with force, proving very plainly that this ligature was below the place of the wound. I applied inſtantly a ſecond ligature above the firſt, the blood was immediately ſtopped, and as immediately did the patient loſe every degree of heat and of feeling in the limb." At this laſt operation of Mr. Duſchamps, his patient had loſt about three porringers of blood; half an hour after he fainted; in a few minutes he revived a little, but a ſtorm paſſing over head at this critical moment with ſome loud peals of thunder, affected him ſo much, that on the third hour after the operation he expired.

"Upon opening the body," ſays Duſchamps, "we found the brachial artery wounded from the outſide and from behind; the wound was above the giving off of the profunda humeri, ſmall, punctured, made with the point of the knife juſt under the border of the great pectoral muſcle; the occaſional ligature ſurrounded the artery immediately below the wound, and that ligature which had ſuppreſſed the bleeding was half an inch above."

Theſe are all the circumſtances of the caſe faithfully tranſlated: But the ma-

nifold miſtakes, though ſome of them are ſufficiently obvious, are yet upon the whole ſo complicated one with another, and are at the ſame time ſo important, that I feel it my duty to explain them to you.

Was it not a weakneſs to ſuppoſe this ſame arteria profunda to be abſolutely eſſential to the preſerving of the limb? And yet this is an opinion which Mr. Duſchamps declares in the moſt unequivocal terms. "Certain other means might perhaps have aſſiſted me in ſecuring the artery in this caſe; although after all," ſays Mr. Duſchamps, "the wound of the artery being above the going off of the profunda, it was in vain to think of ſaving the arm; but ſtill if ſuch means had but ſecured the artery, and ſaved the patient's ſtrength entire, we ſhould have had in reſerve the amputation at the ſhoulder as our laſt reſource *."

Was it not as great a weakneſs to think of ſucceeding by compreſſes, without the compreſſion's being ſufficiently firm to obliterate the artery? Mr. Duſchamps applied his compreſs and bandages ſo ſlackly, that they never affected the pulſe; but had he conceived the true notion of obliterating the artery, and bound his compreſſes ſo as to have ſuppreſſed the pulſe, the artery muſt inſtantly have been forced to bleed, and he would thus have diſcovered at his firſt dreſſing what he diſcovered too late, and only when he drew the occaſional ligature, I mean the place of the wound.

Was it not a conceited and forward thing to truſt thus to his knowledge of the artery, and try to find it out by a new inciſion, when he might have been conducted exactly to the wounded point by the plain direction of that wound through which the knife had touched the artery? By this wilfulneſs, Mr. Duſchamps looked upon the artery on the wrong ſide; he ſaw it only through his own inciſion upon the inſide of the arm, while it had been wounded by a ſtab which reached it through the upper and outer edge of the biceps muſcle, i. e. from without. In ſhort, when the man had been wounded from the outſide of the arm, his ſurgeon looked for the wound from within, and the conſequence was moſt natural, viz. that he felt the whole trunk of the artery beating ſtrongly under his finger, yet could procure no bleeding from it, and could not ſee the wound. This caſe ſatisfies us of a fact, which is proved alſo by other accidents (as the aneuriſm

* "Ce procédé m'auroit été de la plus grande utilité dans la première obſervation. La bleſſure de l'artére, à la vérité, étoit au deſſus des artères profondes ſupérieures, et par conſéquent trop haute pour eſpérer de conſerver le bras; mais le malade alors n'étant pas epuiſé, il reſtoit la reſſource de l'amputation dans l'article."

from bleeding), that an artery wounded with a ſmall and ſlit-like wound, though fairly cut, will yet preſerve its pulſe, and will not bleed.

But when Mr. Duſchamps found that his inciſion was too ſhort, and that his operation was imperfectly done, or not at all, when he found his patient bleeding thus dangerouſly, why did he not exert himſelf? Why did he allow his patient to endure five ſucceſſive bleedings without even undoing the dreſſings, when he ought abſolutely to have laid open the arm? Surely I may ſay that he ſhould have laid it open, when he himſelf ſays, that he had almoſt intended to cut it off.

His inciſion was made from the border of the pectoral muſcle down along half the arm, and into the aneuriſmal ſac. Now, his finger had been paſſed into the ſtab which the knife had made, and had not by a great way gone down into the bottom of that wound; his ligature was placed no more than half an inch beyond the point of his finger, but ſtill it was below the opening of the artery, as was proved during life by the repeated bleedings, and after death by diſſection. Why then did he not go forward with his knife? Why, when he knew the wound to be oblique, when he ſuſpected it to be high, when he thought it was even in the axillary artery, why did he not go forward into the axilla? Why ſhould he have ſtopped at the border of the pectoral muſcle? Or what is this pectoral muſcle that it ſhould be reſpected more than the other muſcles of the body?

But, in the relation of this caſe, the laſt bold ſtroke, the only ſucceſsful one, is the moſt melancholy thing of all. It explains but too well what ought to have been done at firſt, and how ſucceſsful it would have been if it had been done in good time; for he at laſt cut open the arm, tied the artery fairly, and ſo prevented any further loſs of blood.

This idle inciſion on the wrong ſide of the arm, on the ſide oppoſite to the wounded point of the artery; the long ſearching, without being able to ſee the artery, or to force out one drop of blood; the abſurd thought of ſuppreſſing this bleeding by compreſſion, while the pulſe at the wriſt remained entire; and the frequent bleedings and the final iſſue of the caſe; and moſt of all, the ſudden falling down of the arm ſenſeleſs and motionleſs the moment that the great ligature was drawn, including of courſe the artery, vein, and nerves, are the moſt decided marks of a bad operation, ill concerted and ill performed, and are leſſons ſo important, as to make it a duty to criticiſe in theſe rude terms men even of the higheſt name; and therefore it is that I chooſe thus to do my duty, and to bear the blame.

But even in this matter of delicacy, I mean to do ſomething more, both to impreſs this leſſon, and to exculpate myſelf. I will not leave it for any one to ſay, " This, after all, may be but one miſtake of Mr. Duſchamps, counterbalanced by many bold and well concerted operations." It is not ſo ; and I proceed to prove, that if, as I think, he was wrong, he was habitually wrong ; that theſe things were not done merely through the hurry and confuſion of ſuch a caſe, but that this way of cutting for the wounded artery at the wrong ſide of the limb, was his cuſtomary and ſettled practice.

A young man, a joiner by trade, twenty-one years of age, wounded himſelf with a chiſel in the thigh, with a wound ſlanting from without inwards and backwards ; the wound was about two-thirds down the thigh ; the blood flowed with great force, and the young man was carried to the great Hoſpital, la Charité, in Paris, where Mr. Duſchamps was firſt ſurgeon *. The next day, ſays Mr. Duſchamps, at ſeven in the morning, I examined the thigh, found it ſlightly ſwelled, lifted the dreſſings, and as ſoon as I lifted that piece of lint which lay immediately upon the wound, the blood jetted out in a full arch, and the place of the ſtab, and the quantity of blood, left no doubt as to its being a wound of the femoral artery, nor any queſtion about the proper operation, which therefore was deferred no longer than till eleven o'clock."

In preſence of Mr. Chopart, Boyer, and others, I then began the operation, by paſſing a probe into the wound, and the direction of the wound, which it was not eaſy to purſue, carried the probe towards the femoral artery, and, as nearly as I could gueſs, towards that point where the artery paſſes through the triceps muſcle.

" Without minding this wound at all, I made a new one of five inches long in the tract of the femoral artery, ſo directed as that the wound of the artery itſelf ſhould moſt probably lie in the middle of this long cut. The integuments being thus opened, I diſſected through that muſcle which immediately covered the artery, with all poſſible care, till I diſtinctly felt the artery beating under my finger. As there was no extravaſation of blood, and of courſe no cavity, it was impoſſible to lay the artery quite bare ; but yet I cut it up, as cloſely as common prudence would allow of ; the artery wounded from behind, preſented no wound

* " Au tiers inférieur antérieur de la cuiſſe droite, avec un ciſeau dit bédane, dont le tranchant étoit de dix lignes. Cet inſtrument pénétra de *devant* en *arrière*, et de *dehors* en *dedans*, et ouvrit l'artère femorale."

to me on this ſide, and though we ſuſpended the compreſſion at the groin, not one drop of blood flowed, neither from my inciſion, nor from the wound: Once more, I introduced the probe into the wound of the chiſel, and felt the end of the probe not naked indeed, but near the courſe of my inciſion. With the point of my finger I cleaned the parts, wrought with ſponges, left the artery of the groin quite free; but ſtill not one drop of blood iſſued from either wound *."

Thus was Mr. Duſchamps left in great confuſion; certain, by the direction of the wound, and by the bleeding, that the chiſel had touched the femoral artery; uncertain only where to apply his ligatures, or how. He was, moreover, perplexed with the doubts of his aſſiſtants, who not having ſeen the bleeding, and ſeeing and feeling now the ſtrong beating of the artery, feeling alſo the entireneſs of the pulſe in the lower part of the limb, could not believe that the wound had touched the main trunk. They were alſo the more inclined to doubt this, from their not underſtanding what the blunder was which Mr. Duſchamps had committed (viz. cutting on the wrong ſide of the artery), which made it difficult for the artery to bleed, and impoſſible for them to ſee it bleed, whether it was wounded or not.

Something they ſaw muſt be done; Mr. Duſchamps, therefore, cut and diſſected nearer and nearer to the artery, and came as cloſe to it as he ſafely could. The probe put into the wound of the chiſel, ſeemed to touch the artery at the very point where it paſſes through the triceps muſcle; he therefore ſtruck one ligature below the artery, half an inch under the point of the probe, and of courſe, half an inch under the paſſage through the triceps. By ſtraitening this lower ligature in a temporary way, the blood was ſtopped in the canal of the artery, and the artery was forced to bleed above; by this mark, the upper ligature was next put round the artery, higher than its wounded point, and the loop of

* "En préſence de MM. Chopart, Boyer et autres, je procédai à l'opération de la manière ſuivante. J'introduiſis une ſonde dans la plaie; ſa direction, que j'eus de la peine à ſuivre, là conduiſit vers l'artere femorale, à-peu-pres à l'endroit ou elle paſſe à travers le tendon du grand adducteur. *Sans avoir égard a cette* plaie, je fis une inciſion de la longueur de ſix à ſept travers de doigts ſur le trajet de la fémorale, de manière que le lien ou la bleſſure de l'artère pouvoit etre ſuppoſée, ſe trouva dans le milieu de l'inciſion; les tégumens ouverts, je pénétrai à travers le muſcle qui couvre l'artére avec toutes les précautions neceſſaires jusqu'à ce que ſon battement me fut ſenſible.

"Comme il *n'y avoit aucun épanchement ſanguin*, et par conſéquent aucune cavité, il me fut impoſſible de mettre l'artere parfaitement à découvert. J'en approchai le plus près poſſible, et autant que la prudence put me le permettre. Celle-ci, bleſſé à ſa partie *poſterieure*, ne me preſentoit aucune *ouverture*."

this ligature being alſo tightened for a moment, by puſhing the point of the finger under it, immediately ſuppreſſed that bleeding, which the tightening of the lower ligature had produced. Every thing being thus ſettled to the ſatisfaction of Mr. Duſchamps, the ligatures were drawn cloſe and tied, the bleeding was ſuppreſſed, the wounds were dreſſed lightly, and every thing went on well for ſeven days; the limb had recovered from the loſs of its main artery, and what is always more doubtful, the artery itſelf continued ſecure. But on the ſeventh day, thoſe ſecondary bleedings came on by which ſo many patients have died; and it was after encountering great difficulties, after many burſtings of the artery, after much loſs of blood, and, of courſe, an irreparable injury to his conſtitution, that this young man was ſaved. In ſhort, they ſaved with great difficulty a young man of a laborious profeſſion, in the very prime of life; the arteries young, and in that flexible condition in which we ſhould have the beſt hopes of procuring a ſpeedy adheſion, of making an uninterrupted cure! This is a caſe which preſents the following queſtion ſtrongly to us, "Why ſhould not the artery have kept ſteady the very firſt tying, if it was poſſible to keep it ſteady in the end?" But as I have paſſed already through all thoſe rules which direct the manner of ſecuring any great artery, I refrain from mentioning many of the unfortunate accidents of this caſe, keeping plainly to the point in queſtion.

It is ſufficient to ſay, that Mr. Duſchamps had made miſtakes in the very beginning of this caſe, which never after could be corrected; and all the frequent yieldings of the artery, and the terrible loſs of blood, were owing merely to the arteries being irregularly tied.

What buſineſs had Mr. Duſchamps to truſt ſo much to his own knowledge, as to make an inciſion in the courſe of the artery, when he might ſo eaſily have taken the plain direction of the wound? Why ſhould he have looked on the inſide of the femoral artery for the wound which had reached it from without, and which he might have known had touched the artery only on its ſide or back part? At the time when he might have ſeen his miſtake, why did he continue cleaning and working on the inſide of the limb, at the inciſion which he himſelf had made, when he might ſo eaſily have enlarged that wound, through which the point of the chiſel had touched the artery? Surely, if the wound was not on the fore-part of the artery, where he was looking for it, it muſt have been behind: Why then did he continue diſſecting, with much danger and difficulty, upon a ſound part of the artery, when he might have gone to the wound of the

chiſel, and diſſected the artery at a place where, being already wounded, it would have been leſs unfortunate, even ſhould he have touched it again? But what temptation, above all, had he to forſake the courſe of the natural wound, ſince he had ſeen (when with his own hand he firſt lifted the dreſſings) a high arch of blood thrown directly from that wound? As Mr. Duſchamps durſt not make his diſſection ſo clean, as abſolutely to touch, or to ſurround, or to inſulate the artery, what had he to expect from the deep ſtroke of his aneuriſmal needle, with which he placed the ligature? Nothing ſurely, but that it ſhould ſuppreſs the bleeding only for the time, to burſt out more furiouſly when the fleſh under the ligature faded, and more dangerouſly, ſince it might burſt out ſuddenly in the night, perhaps after the attendants were exhauſted with watching, or when by uſe and cuſtom they were grown careleſs and too ſecure.

That the ſlackneſs of the ligature was plainly owing to the fading of the parts which were included along with the artery, is proved by the following paſſage: "When on the evening of the ſeventh day a violent hæmorrhagy came on, I lifted the dreſſing, and found the ligature ſo relaxed, that it had no longer any purchaſe upon the artery, having in a great meaſure cut through the muſcular fleſh *."

Had the dreſſings been lifted, and the ligature found thus ſlackened twenty-four hours after the operation, I ſhould have thought Mr. Duſchamps not far wrong in ſaying, "for the ligature had cut through the muſcular fleſh." But when on the ſeventh day he finds this ligature ſlackened, and the muſcular fleſh gone, he ſhould have ſaid rather, "the muſcular fleſh under the ligature having gangrened, and being conſumed, I found the ligature quite looſe."

You muſt next obſerve, that the depth and obliquity of ſuch a wound, prevents the bleeding at firſt; and that often it is not even ſuſpected that an artery is wounded, when ſuddenly, on the tenth or twelfth day, it burſts out with ſuch violence, as to endanger the patient's life. It is not in gun-ſhot wounds alone that this happens, where the artery is not actually open till the ſlough falls off on the eighth or tenth day, but in clean wounds with a pike or bayonet! for in thoſe only, could the delay of hæmorrhagy be attributed to the obliquity of the wound. In the practice of the older ſurgeons, we have many examples of this, for in their

* Je levai l'appareil; à l'examen, je trouvai la ligature relachée, et telle qu'elle n'avoit plus aucune action ſur l'artère, les parties muſculaires, compriſes dans la ligature, etant en partie *coupées*"

days duels were frequent, and were always fought with the ſword, and when a gentleman was wounded in the ſword-arm, it often happened, that although the ſword had run obliquely along from the wriſt to the elbow, and wounded the brachial artery at the bend of the arm, no bleeding appeared outwardly, the firſt iſſue of blood was ſo reſiſted by the cellular ſubſtance, that it ſoon coagulated, and filled up the narrow wound, aſſiſted by the inflammation and ſwelling of the parts. A firm coagulum was formed, and it was only on the tenth or twelfth day when the ſuppuration was free, and the clot began to ſeparate, that the blood burſt out. Le Dran's Forty-eighth Obſervation, contains the caſe of a gentleman in the regiment of Noailles, who was thus wounded with a rapier in the ſword-arm; the ſlight bleeding was ſtopped with ſmall doſſils of lint, and the next day his hand and fore-arm were in good condition. Le Dran, in examining them, found no ſymptoms of a wounded artery, there was a little ecchymoſis towards the elbow, and a moderate ſwelling of the whole arm. The doſſils were at laſt withdrawn, the cure went on well, the pus was formed, the arm was not ſwelled, no ſymptoms of a wounded artery appeared till on the ſeventh day in the afternoon! Being preſſed to go backward, he went behind his tent with his arm in a ſling, and having, in adjuſting his clothes, either ſtreightened or twiſted his arm, a conſiderable hæmorrhagy appeared ſuddenly. When the conſultation met next day, it was plainly ſeen that the artery was open, the bloody tumor now extended from the elbow to the arm-pit, Mr Le Dran adviſed the opening of the tumor, or the amputation of the arm; his advice was neglected; the army made a movement; this gentleman was ſent to Namure; the hæmorrhages returned; the ſurgeon was long in reſolving on amputating the arm, and when he did at laſt perform it, the gentleman was ſo far exhauſted by ſucceſſive hæmorrhages, that he died.

This artery was found, upon diſſection, to be wounded above the condyle, and a hard clot of blood which preſſed it down againſt the bone prevented the bleeding *.

* In the 50th Obſervation of Le Dran, is a caſe very ſingular and intereſting, where a young gentleman, wounded in the fore-arm in a duel, had a great ſwelling in the arm from the elbow to the arm-pit, hard, black, and ecchymoſed. He had violent pain in the palm of his hand, there was no pulſation in the wriſt, the hand was cold; by proper treatment the tumor diminiſhed, the pulſe and the natural heat began to return, and the pains were leſs acute, when one night the patient moving his arms awkwardly in bed, felt ſomething extraordinary, which diſquieted him the whole night, and the next morning his ſurgeon found the ſwelling returned, &c. This caſe illuſtrates ſeveral of the principles which I have explained in treating on aneuriſm, it is a caſe of wounded artery obliterated by the preſſure of the aneuriſmal tumor

Thus, it often happens through miſmanagement, that the ſwelling, the hæmorrhages, the gangrene ſuddenly terminate in death, but in ſuch wounds, the caſe is often protracted to a greater length, diſplaying as it were in detail, all the dangers of an oblique wound.

A ball, we ſhall ſuppoſe, paſſes along the fore-arm, rakes along the two bones, wounds the radial or ulnar artery in the bottom of a deep and narrow wound, and then paſſes out beyond the elbow, making an opening too ſmall to let out the blood; or we ſhall ſuppoſe the oblique ſtab of a knife, ſword, or bayonet, touches an artery, lying thus in the heart of the fore-arm, under all the muſcles, and cloſe upon the bone; then the following conſequences enſue. The profuſe bleeding, at firſt, proves that ſome artery is wounded; the direction of the wound aſcertains that it is the radial or ulnar artery; the ſtopping of the outward bleeding, cauſes an internal aneuriſm, different from the greater aneuriſms of the arm or thigh, as it lies not under a faſcia, forming a fair circumſcribed aneuriſmal bag, but under the bellies of all the muſcles, which are ſeparated from the bones, by a very irregular and a very dangerous collection of blood. The outward bleeding is ſoon ſtopped by compreſſes, and a bandage; the friends are leſs alarmed, ſeeing nothing but a narrow ſlanting wound; but when the next morning, they ſee the arm black with the injected blood, and ſwelled to an enormous degree, their fear is like their indifference, before quite ignorant, and beyond the true meaſure; they believe this to be an abſolute gangrene, and that the patient is loſt; while the ſurgeon ſees in this blackneſs, not the ſigns of gangrene, but the marks of a wounded artery, and foreſees a difficult and tedious operation of ſeeking it out.

But if again the ſurgeon have not the ſkill to perceive all the dangers of the caſe, the apparent gangrene is ſoon changed into a real one; the limb becomes cold, benumbed, and has a livid redneſs upon its ſurface; the ſkin without runs into a low inflammation; the blood within increaſing every day in quantity, corrupts and burſts out; and thus, as I have hinted before, it is not merely by the wound of its great artery, and by loſing the great trunk that nouriſhed it, that a limb is loſt; but in a caſe like this, it is loſt by the deep driving of the blood a-

which roſe over it; the blood was gradually diſcuſſed by ſuppuration, the pulſe of the wriſt was gradually reſtored in conſequence of the enlargement of the collateral arteries, it is a proof that the internal hæmorrhages which fill up the meaſure of an aneuriſm are ſucceſſive, which is the reaſon of the irregular growth of aneuriſm, and of its enlarging in proportion to the freedom the patient ſes with the limb.

mong the fleſh and bones. Either the outward bleeding is allowed, and the patient is in danger of immediate death, or the blood is confined, and the bleeding goes on within; ſo that every time the artery burſts out, the limb is injected anew, as it were, by the arteries, and is in imminent danger of gangrene at every new effuſion of blood. The matter is bloody, fetid, corrupt; it prevents the reunion of the bones (if any bones be broken), it makes foul ſuppurations, and extenſive and fetid ſores; and each new ſuppuration is ſucceeded by a diſſolution of thoſe clots which had for a time ſtopped up the artery, ſo that again the blood burſts out; till at length, after many months of ſuffering, the patient is forced to part with that limb which he has undergone ſo many dangers to preſerve. The extenſive ſinuſes, and foul ſores, the diſorder of the joints, and the total caries of the bones, makes every ſuch caſe incurable; there is, even from the very firſt moment, no other alternative for the ſurgeon, than either to perform immediately a bold deciſive operation, or to reſolve at once (not keeping the patient in this lingering and cruel condition) to cut off the limb. To the patient himſelf the queſtion may be honeſtly propoſed in theſe terms: "Will you have this tedious, but neceſſary operation, of tying the artery, regularly performed? Or will you, to ſhun a preſent pain, linger for months in this miſerable condition, conſenting at laſt to loſe the limb, when it is perhaps too late to ſave your conſtitution, or even your life!"

This is the full deſcription of that caſe, which I hinted at in the beginning of this diſcourſe, when I ſaid, that ſometimes the arteries are wounded deep among the muſcles, and there the blood corrupting the muſcular fleſh, and even ſpoiling the bones, is the occaſion, after long ſuffering, of the patient's loſing often his limb, and ſometimes his life. Nor is it neceſſary to produce all thoſe miſchiefs, that along with this wound of the artery, there ſhould be a fracture of the bone; the moſt ſimple puncture of the ſmall ſword, pike, or bayonet; the mere wound of the artery, often coſts the patient his limb. But the caſe, though naturally dangerous, and requiring ſevere and bold operations, is rarely fatal, except from want of reſolution and want of knowledge on the part of the ſurgeon.

The firſt ſurgeons cannot be in all parts of a field of battle. The wounds, in the firſt inſtance, are dreſſed, and conducted for ſome days by young men; it is only when the patients arrive at ſome general hoſpital that their wounds, or rather the conſequences of their wounds, are rightly underſtood. The wounded arteries are

generally no better ſecured than in the caſe related by Belloſte in his Hoſpital Surgeon: "It is the caſe of one Beaulieu of the King's battalion who was wounded with a ſword between the radius and ulna; he remained eight or nine days in his quarters, being dreſſed by one of the mates, who, without making any diverſion, only ſhut up the wound with a *ſtrong ſtopple*, which reſtrained the great flux of blood between dreſſings, but in time of dreſſing, he bled exceſſively. The blood which was extravaſated in the member did there corrupt, and cauſed abſceſſes in ſeveral places, but at laſt his ſurgeon ſeeing that his ſtrength daily diminiſhed, and fearing ſome fatal accident, ſent him to the general hoſpital*." Belloſte, in this caſe, made the ſame uſe of pellets of lint, dipped in vitriol, that you would make of ſponges, by thruſting them down to the bottom of the wound where the artery was open.

In the fighting of duels, ſlanting wounds in the ſword-arm were often cured by the ſuckers; by ſucking the blood, by compreſſing the wound, by a gentle bandage and ſlinging the arm; they were, in plain terms, cured by adheſion. But when in place of being a ſimple wound, the artery was punctured, the conſequences were often fatal.

Bohnius, in his book de Renunciatione Vulnerum, relates a caſe which I cannot but conſider as an inſtructive inſtance of ignorance and negligence. He was called to attend a young man of the firſt family in the province, who had been wounded in the fore-arm a little above the wriſt, the wound was narrow indeed, but it reached nearly from the wriſt to the bend of the arm, the weapon paſſed under the ſkin and muſcles, it had raked along the bones, and twice in the courſe of ten days had the blood burſt out furiouſly, and per ſaltum. The arm was ſwelled, the fore-arm extremely painful, a livid redneſs extended to the ſhoulder, and this gangrenous ſwelling burſt in about three days after, at the bending of the arm, diſcharging a bloody and ſerous matter, with ſome abatement of the fever, ſwelling, and pain. But from the time of Bohnius being firſt called, there was for thirteen days no eruption, but on the thirteenth day it burſt out moſt impetuouſly; two days after the blood burſt out again; and eight days after this, the blood burſt out again moſt furiouſly at both wounds, i. e. by the punctured

* Belloſte, after relating the difficulties he had to ſtruggle with in ſaving this man's life, concludes the caſe with this prudent reflection, as he terms it: "This kind of wound, where arteries are opened, are of all others the moſt tickliſh, they give great a deal of *trouble*, and but little *reputation* is gained by the cure."

wound near the wriſt, and by the greater opening where the fore-arm had burſt from gangrene. This young gentleman was wounded on the 3d of September, and after two months of pain and ſuffering, frequent bleedings, and continual alarms, he expired on the 9th of November.

Upon diſſecting the arm, it was found, that the ſword paſſing along under the muſcles from the wriſt to the elbow, had ſlit up the radial artery for the length of half an inch, exactly up to that point where it comes off from the brachial artery. The lips of the ſlit were callous and hard.

Even Bohnius, a man of high rank in our profeſſion, makes a poor apology for the death of this fine young man, " that an artery wounded at ſo great a diſtance, it was impoſſible to ſee *." How, indeed, could they ſee the artery? they never had dilated the wound, nature had indeed done ſomething towards ſhowing them the artery, the arm had burſt over the very place where the artery was wounded, (viz. in the bend of the arm) but on their parts they had done nothing; they had crammed this ulcerated place where it had burſt with doſſils, but the wound they had never dilated; Bohnius, even to the day of the patient's death, ſpeaks of it as a puncture.

Here are leſſons of no ſmall importance. The caſe proves, 1ſt, What deſtruction this kind of aneuriſm will produce, viz. gangrene and burſting of the arm. 2d, How long the artery will continue open, gradually bleeding the patient to death by ſucceſſive eruptions of blood. 3d, That however painful your operation is, it muſt not be neglected, elſe the patient muſt ſuffer, and when at laſt the danger becomes apparent, although you ſhould reſolve to cut off the arm, it will be too late! to cut off an arm ſo gorged with extravaſated blood, ſo ſwelled and inflamed from the wriſt to the ſhoulder, would be to commit a deliberate murder.

You now underſtand why an experienced ſurgeon will make deep inciſions, where a man of leſs ſkill would find no danger. An experienced ſurgeon would make inciſion into ſuch a wound at once! If the young ſurgeon ſhrinks from ſo hardy an operation as that of dilating a deep and ſlanting wound, it is becauſe he is not aware of the danger.

Theſe conſequences are not limited to any part of the body; wherever an ar-

* " In præſentiarum innuere ſufficiat difficultatem medendi huic hæmorrhagiæ deplorandæ, quæ in illo præprimis videbatur conſiſtere, quod vulnus arteriæ ſanguinem fundentis a vulnere externo adeo diſtaret, ut ejus ſitus determinari haud potuerit." BOHNIUS, page 48.

tery, of conſiderable ſize, yet not large enough to create a formidable aneuriſm, is wounded deep under the muſcles of the limb, the conſequences are the ſame. But if the wound be produced by a ball, and if the bones be fractured, the deſtruction of the limb is almoſt inevitable. I have extracted for your uſe, the following inſtructive caſe from Mr. Allanſon's book on Amputation.

Harry Knowland, a ſeaman, was wounded in an engagement, with a ball, which entered under the patella, broke the tibia and fibula obliquely near their upper end, paſſed obliquely through the leg backwards, and a little downwards, and came out at the middle of the calf of the leg, followed by a great bleeding from the wounded arteries, and many ſplinters of bone *.

A well inſtructed ſurgeon would have made a large and bold inciſion, laid open the wounded veſſels, that he might tie them; would have picked away all the looſer ſplinters of bone, but would have been careful, above all, in tying the arteries, knowing that if they continued to bleed outwardly, the patient might die; if inwardly, that they muſt inject the leg ſo ſtrongly with blood, that it might fall into gangrene, and would, at all events, run into a foul and gangrenous ſuppuration; that the bones alſo, far from reuniting, would, in a few weeks, be thoroughly and irrecoverably diſeaſed.

A fortnight after this wound, nothing having been done, meanwhile, to ſave his limb, this man was carried on ſhore and put into the Liverpool Infirmary, where he lay four entire months. At firſt his knee and the whole leg were great-

* As one proof of the neceſſity of cutting boldly, obſerve what Gooch ſays, p. 341. "Among the reſt of our converſation at this time, there was mentioned a caſe, in which one of the arteries betwixt the tibia and fibula was opened about the middle of the leg, and the bleeding was ſtopped from time to time by various methods, but at laſt it was thought adviſable to amputate the limb." Mr. Gooch propoſes rather to cut out two or three inches of the fibula, and ſo expoſe the artery; and I would add, that I ſhould rather do any kind of operation, however cruel and tedious, than cut off the leg.

The imprudence of confining the blood, or of delaying the operation, is well explained by the notes which our old Surgeon Wiſeman gives us, of a caſe in which he was trying to cure a popliteal aneuriſm by aſtringents and by compreſſion. He informs us, p. 122, "That while he endeavoured to keep the blood within the abſceſs, it inſinuated itſelf between the muſcles, making the calf of the leg hollow to the very tendon." This, we find, obliged him to make long inciſions through the calf of the leg, before he could accompliſh the cure. In ſhort, whether the artery requires to be tied, or whether the bleeding ſtop, we ſhould neither confine the blood nor procraſtinate our operation; nor make our inciſion too ſmall; for the driving of the blood in this leſſer, as in the greater aneuriſms, diſorders the ſoft parts, ſpoils the bones, puts the artery further out of our reach, and makes the abſceſs extenſive, the operation difficult, and the cure tedious; ſmall inciſions alſo prevent the artery being well ſeen or clearly tied.

ly ſwelled; the leg and foot cold and œdematous, with a very languid circulation through the whole limb: He had moreover a fever upon him, with a great depreſſion and languor, a foul tongue, and a ſmall quick pulſe.

When the bullet holes were firſt dilated, there iſſued a great quantity of ſanies highly fetid, mixed with clots and putrid blood; and bark and wine were uſed during this putrid or gangrenous ſtate; and free dilatations were made when the time arrived, for giving vent to the foul ſuppurations.

In the courſe of this tedious caſe, the callus often began to form, and the ſurgeons entertained hopes of accompliſhing a cure; but the deep ſeated hæmorrhagy continually returned upon him, coagulated blood was accumulated anew in every part of the limb, with a new diſcharge of putrid ſanies, new ſinuſes, new ſuppurations; and thus, from time to time, the incipient callus was deſtroyed.

Four months they ſtruggled againſt theſe diſappointments and difficulties, ſupporting him all along with diet and wine, often dilating the openings for the putrid ſanies, and ſometimes extracting the ſplinters of bone, till at laſt ſuch a bleeding came on, as put an end at once to all hopes of a cure. The whole limb was relaxed and ſwelled; the cellular ſubſtance gorged with coagulated or putrid blood; the hæmorrhage came deep from among the callus, from the very centre of the limb; the man was quite emaciated; his ſtomach was ſo enfeebled, that he could receive no ſolid food; his health was already broken, and it appeared imprudent to ſtruggle longer, it was plainly impoſſible to ſave the limb; it was accordingly cut off*.

The plain rule reſulting from this caſe needs hardly be explained; it is ſcarcely more than a recapitulation of that rule which has been already delivered: but it puts it in a ſtronger point of view, viz. that we ſhould cut boldly; ſeek freely for the artery; tie it ſecurely with the needle: and it is only where the artery can by no means be taken up with the needle, that you are at all to truſt to the ſponge, and even then, not willingly, nor without every precaution of firm compreſſes, tight bandage, a tourniquet put lightly about the limb to ſecure the patient from any deadly hæmorrhagy, and the appointing of attendants well accuſtomed to ſuch a charge.

* Upon injecting the amputated limb, the wound was found to be in the poſterior tibial artery. It had been cut entirely acroſs by the ball; the upper end indeed had, by ſome accident, cloſed up; and at the final hæmorrhagy, perhaps alſo at many of the former hæmorrhages, had come from the lower end of the wounded artery, the blood having returned freely by the inoſculations of the foot and leg.

The thoracic artery, though ſmall and apparently unimportant, produces often the moſt diſtreſſing conſequences when wounded, and requires a bold operation. This ariſes from the looſeneſs of the cellular ſubſtance which ſurrounds the great veſſels and nerves in the axilla, and ſuch is the power of this long and ſlender artery over the cellular ſubſtance, that it drives its blood freely under the pectoral muſcle. The aneuriſm which it forms is as large ſometimes as that of the thigh! It often happens after a wound of the thoracic or external mammary artery, that the whole ſide is blackened with the ſuffuſion of blood; the great cavity of the axilla itſelf is filled with blood (and it is capable of containing a great quantity), the back and breaſt are black with the ecchymoſis. The appearance is ſo formidable that the ſurgeon ſuſpects ſome mortal wound; the ſide is ſo loaded with blood that the patient is oppreſſed, and he labours ſo in his breathing, that we ſhould believe him wounded in the thorax, but that there is no cough nor blood coming up from the lungs, nor emphyſema from air iſſuing by the wound. From the ſize of the aneuriſm in the axilla, one would, on the other hand, be apt to believe the axillary artery itſelf wounded, but that the pulſe at the wriſt continues firm. When the axilla is thus filled with extravaſation, and the back and breaſt blackened with ecchymoſis, a gangrene of the ſkin muſt ſooner or later enſue; the diſcharged blood will become foul and very fetid; the deſtruction of cellular ſubſtance and the irregular abſceſſes muſt extend far and wide; the diſorder will be ſeveral months in being cured; it ariſes from ignorant ſurgeons thruſting their ſtoppels of lint into that wound, which is very diſtant from the place where the wounded artery lies, which of courſe continues to bleed within.

This muſt be prevented. It would no doubt be very wrong to cut up the axilla, or touch the pectoral muſcle in purſuit of every trivial artery that may be wounded on the fore part of the breaſt; nor would it be ſenſible to make inciſion always when the long pectoral artery itſelf is wounded; for often the thoracic arteries, when wounded with ſwords or muſket ſhot, bleed very ſmartly, and yet ſtop of their own accord, upon applying merely a piece of lint to the wound. Indeed it is not on account of the actual wound of the artery that we perform any operation, but to prevent the deſtruction of the cellular ſubſtance and the diffuſion of the blood; therefore when you find that applying a piece of lint with ſlight compreſſion ſtops the bleeding, without any appearance of extravaſation, you remain ſatisfied. But if you be called to your patient a few hours after the firſt dreſſing, on account of an incipient ſwelling and ſlight oppreſſion of the breaſt,

and find that the extravaſation among the looſe cellular ſubſtance in the armpit is begun, you muſt undo your bandages, withdraw your bit of lint, which is merely a ſtopple confining the blood, dilate the wound, put in your finger and advance it till you feel the jet of warm blood; hook out the clots which lie over the mouth of the artery, and lay your compreſs directly upon it. Then pile compreſſes over it on the outſide and apply your roller; for it is ſeldom neceſſary to cut the wound entirely up, or to uſe the needle in wounds of the thoracic artery.

In the time of Belloſte ſurgery was ill underſtood; he was a ſharp remarker, and we have numerous inſtances of miſconduct mentioned in his little book. Among other caſes I find the following: "If at firſt we join the lips of a wound and apply aſtringents upon them, the outward bleeding may be depreſſed before that of the veſſels is reſtrained, and ſo the blood running betwixt the muſcles may there be corrupted, and may ſpoil the parts wherein it is contained and thoſe that border upon them, and may alſo occaſion ſuffocation and a gangrene. This is what I ſaw at Turin befal the Baron de la Serra, a gentleman of Savoy, who was wounded with a ſword near the right armpit, and had a branch of the vena ſubclava opened. He was dreſſed by a very expert ſurgeon, who, whether by chance or otherwiſe, neglected to apply aſtringents to the aperture of the veſſel, though the bleeding was very great. The wound was joined, and the part loaded with aſtringents, which were made faſt with compreſſes and bandages. In the mean time the blood continued to run from the vein and to diffuſe itſelf between the muſcles of the breaſt. Two or three days paſt before the firſt dreſſings were taken off, and then the thorax was found to be gangrened; the wounded perſon died in a little time after." Here then I conclude my obſervations on this diffuſed aneuriſm.

### RULES FOR STOPPING THE HÆMORRHAGY, FROM ALL SMALLER ARTERIES.

1. Styptics can avail us very little in any dangerous hæmorrhagy, and they ſtand in our liſt, chiefly becauſe they were valued by the older ſurgeons, who, though they uſed the needle, never could rid themſelves of all their prejudices, nor uſe it freely. With us ſtyptics are little valued, we never think of uſing them, except in bleedings from arteries of the very ſmalleſt ſize; where the hæmorrhage is of ſo little danger, that we would not trouble our patient with the

ſharp pain, which the needle cauſes; we do not uſe them where we ſee the bleeding artery, or where we can uſe the ligature or the compreſs; we find them uſeful, chiefly in oozings of blood from hollow paſſages, as in bleedings from the noſtrils, the gums, the throat, the alimentary canal, or womb; or in bleedings from foul ulcers, from the cavities of deep ſores, or from any broad and diſeaſed ſurface, where the bloody exudation may be checked, and the condition of the ſurface improved at once, by the ſtimulant nature of our ſtyptics. The beſt of theſe ſlighter ſtyptics are diluted vinegar, ſpirits, mineral acids, or ſolutions of alum.

2d, There are alſo caſes, where we ſhould chooſe to diſregard the bleeding from the ſmaller arteries, even though they be of ſuch a ſize, as to be ſeen throwing out their blood by jets; indeed, we perform few operations, in which we do not ſee little arteries throwing out their blood, which before we have finiſhed our inciſions, have ſhrunk, and have ſo injected the cellular ſubſtance round about them, that it is thickened, and their mouths are cloſed; ſuch arteries are no more troubleſome, and the cure goes on well. In like manner, in wounds, and in operations alſo, we often ſee little arteries opened, which we diſregard altogether, allowing them to exhauſt themſelves; we keep the wound expoſed to the air, and when the bleeding and general oozing relents a little, we clean it, at leaſt we clear away the groſſer clots of blood, which might prevent its re-union. Then laying the lips of the wound together we place our compreſſes in ſuch a manner, as to preſs the lips of the wound againſt each other, and likewiſe againſt the bottom of the wound; ſo that theſe compreſſes, which thus procure the adheſion of the wounded ſurfaces, prevent, at the ſame time, any further bleeding within. The bandages of ſuch a wound ought to be painfully tight at firſt, and may be ſlackened in a few hours.

3d, In all hæmorrhages, where we have a full and rather a dangerous bleeding, and in which we ſee diſtinctly one or two great arteries or veins throwing out blood, the bleeding muſt be ſuppreſſed either by the ligature or by a ſteady compreſs, and the ligature, wherever we can uſe it eaſily, ought to be preferred.

4th, If an artery of a ſmaller order, and lying firm againſt ſome bone, as in the hand, or foot, or temple, be cut; if either by a punctured wound a ſmall aneuriſm be formed, as in the wriſt or at the root of the thumb; or if by a blow the artery be hurt againſt the bone and burſts, ſo that a ſmall beating aneuriſm enſues; we do not, in ſuch caſe, always go regularly to work, we do not chooſe to give the

patient the pain of opening ſuch a tumor; but ſometimes by departing from the general principle, we manage the particular caſe more eaſily; we apply a compreſs, which being tied down hard and firm for two or three days, obliterates the artery, by preſſing it againſt the bone. The blood of ſuch a trivial aneuriſm is as eaſily abſorbed as that bloody tumor which we ſee ſo often on the heads of children immediately after birth, and which we are accuſtomed to diſregard. The compreſs is like that with which we ſtop the Temporal Artery, after opening it with the lancet.

5th, The manner of making compreſſion to obliterate an artery muſt vary according to the circumſtances of the caſe: Sometimes, as in ſmall and ſuperficial aneuriſms, it ſhould be made above the ſkin, and on that part of the artery where it enters the ſmall aneuriſmal effuſion; and the artery which feeds the aneuriſm being thus obliterated, the blood already extravaſated will be abſorbed, and the little tumor itſelf will quite diſappear, leaving but a ſlight thickening, or perhaps none. Sometimes, as in wounds, we make the compreſſion within the wound; and for ſuch a purpoſe there can, perhaps, be no better nor firmer compreſs than a ſmall pellet of chewed paper, a piece of cork, a piece of folded leather, a piece of firm ſponge or agaric, or a firm compreſs of folded linen; any thing, in ſhort, will do for a compreſs, if it be but firm in itſelf and neatly applied.

The compreſs thus introduced into a wound, and placed upon the mouth of the bleeding artery, muſt unavoidably interrupt the cure by adheſion, but this is only for a few days; for when it is withdrawn on the ſecond or third day, the parts may then be laid together ſo as to adhere.

6th, But the arteries of the wriſt, the palm of the hand, the fore part of the foot, &c. are of ſo great a ſize, that though when bruiſed, or hurt, or ſtabbed, and the ſkin healed over the wounded veſſel, the aneuriſm is commonly of a trifling ſize and eaſily cured; yet in open wounds where theſe arteries are cut by working tools, a carving knife, &c. in the wriſt or the foot of a large and ſtrong man, there enſues a ſcene of terrible confuſion and perplexity; which perplexity, is itſelf the chief cauſe of ſuch loſs of blood, as often injures the conſtitution, when it does not endanger the life: for the friends gather up napkins and cloths confuſedly, wrap them looſely and in a hurried way round the limb, and each cloth, as ſoon as it is ſoaked in blood, they remove, as if they had no other intention than the childiſh one of hiding from the patient what quantities of blood he is loſing! while, if in-

ſtead of this general compreſſion of cloths wrapped irregularly round the limb, they could have but the boldneſs to look upon the wound, and preſs upon the very point where the artery is bleeding, they might, with one finger only, ſuppreſs it, and with a ſingle touch. Then, let the recollection of this be a leſſon to the ſurgeon, and let the very ſight of this confuſion put him in mind of his duty, which is to ſtrip off theſe confuſed bloody cloths as quickly as poſſible, and preſs the point of his thumb or finger directly upon the bleeding veſſel.

7th, The bleeding being thus reſtrained, let the ſurgeon clean the limb, appoint his aſſiſtants, lay the hand upon a table and pillow; or if it be the leg, lay it out firmly upon a ſtool. If he have no good aſſiſtant, let him make a temporary tourniquet with a common garter and a piece of ſtick; but if he have any profeſſional man to help him, then he ſhould ſtill prefer the ſuppreſſing of the bleeding with the point of his finger, becauſe in a moment he can let go the artery and can cloſe it again as ſuddenly; in ſhort, he can let go the bleeding artery more quickly, and can look at it more frequently, and with leſs loſs of blood, than in uſing the tourniquet. Having thus fixed his eye upon the bleeding artery, he either draws it out with the hook or forceps, or he ſtrikes his ligature under it with the needle; or if neither of theſe can be done, he puts either a regular tourniquet or this occaſional tourniquet round the arm, and cuts up the wound freely, till he ſees the artery bleeding with open mouth.

8th, Whatever blood the patient loſes before a ſurgeon arrives, is part of the natural danger of his wound; but it is a great diſgrace to the ſurgeon if he loſe much blood afterwards. Succeſſive bleeding, ſucceſſive divings with the needle, the taking in of arteries, tendons and nerves, all in one great ligature! and hæmorrhagies ſtill ſucceeding to theſe clumſy operations, are far from being honourable to the ſurgeon; eſpecially ſince theſe wounds of the fore-arm, or leg, or hand, or foot, are in parts where we may uſe greater freedom. The ſurgeon, then, ſhould do his operations boldly; he ſhould not be ſparing in his firſt inciſions (if he have but knowledge enough of the croſs ligaments, tendons, and nerves, to make ſuch inciſions ſafely); for if once he ſuffer this wounded artery to aſſume an aneuriſmal form; if he oppoſe the blood by ſlight compreſſes, permitting it all the while to bleed within; the artery will ſhrink, the cellular ſubſtance will be crammed with blood, and the ſkin thickened alſo by inflammation. The ſeeking out of the artery among ſuch a confuſion of parts will be inconceivably difficult, both becauſe it does not bleed ſo as to direct us, and be-

cauſe it lies deep, and becauſe the ſurgeon cuts very timorouſly; for even a bold man will be apprehenſive when he finds himſelf cutting through parts which he does not underſtand! and, in this particular caſe, the parts are ſo maſſed together, that he can diſtinguiſh no one part from another, unleſs he prolong his cut either above or below the place in which the blood is extravaſated where the arteries are free. In ſhort, as he cuts through two inches of confuſed ſubſtance, and on ſo naked a part as the wriſt (e. g.) he hardly doubts that he is cutting through muſcles and every thing, while in fact he is cutting only through the ſkin, thickened to this degree by inflammation that has laſted for two or three days, and by the continual driving of the blood.

The rule which ariſes out of this repreſentation of the caſe is very plain, viz. not to be ſparing in the firſt inciſion; to do this firſt and great point of the operation decidedly and boldly. The leaving no doubt about the tying of the artery, and no poſſible occaſion for future inciſions, is in the end the greateſt ſaving of pain; the firſt operation is eaſier than the ſecond, and the ſecond operation is eaſier than the third. It is owing to this miſplaced lenity of making ſmall inciſions at firſt that any ſecond operation is ever required: It is owing to a want of ſtill greater boldneſs in the ſecond operation, that a third is ever required; and we know too well how often a want of ſucceſs in the third or fourth operation has tempted the ſurgeon to cut off the limb *.

* It cannot be ſuperfluous to remark here, that thoſe who have the brachial artery tied, as in aneuriſm at the bend of the arm, recover the pulſe of the wriſt, but that thoſe who have the radial artery itſelf wounded have no pulſe at the wriſt. The compreſſion obliterates always a conſiderable extent of the artery, and the ligature itſelf obliterates the canal of the artery for ſome ſpace above and below that where it is applied.

I once diſſected a patient who laboured under paralyſis of one ſide; the pulſe in that arm was entirely wanting. This very ſingular accident gave riſe, before the patient's death, to many ingenious ſpeculations, not unlike the lucubrations of the celebrated Haller, in his theſis "On the Influence of the Nerves over the Arteries;" but the man died. I diſſected his arm, and found the artery obliterated from the middle of the arm through the fore-arm and wriſt. It was firm and cord-like, reſembling the hypogaſtric arteries.

Tulpius, page 258, obſerves a frequent luſus naturæ of the radial artery, which, in place of running along the fore part of the wriſt, turns round, and is felt only at the root of the thumb; and tells of "one of the ſenators of the Batavian republic, whoſe phyſician not perceiving any pulſe at his wriſt, pronounced him ill of the plague." But I am ſpeaking of the pulſe ceaſing from wounds of the wriſt. In the ſabre wounds which horſemen receive, this is often a conſequence. One old author mentions, that in a military hoſpital of Poliſh and German huſſars, he ſaw many inſtances of this, and at firſt did not know the rea-

9th, The ſponge is often more uſeful than the needle, and that, too, in caſes of the greateſt danger. Wherever the wounded artery lies deep, and we cannot cut for it, on account of the nearneſs of ſome great artery or important nerve, as, for example, in the axilla, about the neck, or about the angle of the jaw; wherever the bleeding artery is ſo nitched in between two bones that we cannot draw it out with the tenaculum, nor reach it with our crooked needle, as, for example, in the fore-arm, or between the bones of the leg; in ſhort, wherever we cannot ſee the artery, or cannot ſtrike it ſafely with the needle; wherever the bleeding is not ſo much from a particular artery as from a general ſurface; or wherever the blood is thought to flow rather from great veins than from arteries (as in tearing out cancerous glands from the arm-pit); in all ſuch caſes we uſe the ſponge, and we uſe it in the following manner: We keep the ſponge dry and hard compreſſed, and always ready for uſe, and when it is to be uſed, it is cut into ſmall pieces, ſquare or long, as the inciſion requires, and ſmall threads are tied to the ſponges, by which they may be drawn away in due time. In any dangerous hæmorrhagy of this kind, we chooſe out a piece of ſponge proportioned to the ſize of the wound, thruſt it down to the bottom of the wound, fix it there with the point of the finger, either expreſsly upon the mouth of the bleeding artery, or if that cannot be diſtinctly ſeen, upon the place at which the artery bleeds; then lay one compreſs above the ſponge, a ſecond compreſs above the firſt, a third above the ſecond; and taking care to keep the compreſſes always ſteady with one finger, to prevent the blood ſoaking into the firſt ſponge, and

ſon of the want of pulſe, till ſome of them ſhowed him the ſcars of their wounds. Perhaps the moſt pertinent anecdote is the little wicked ſtory which Turner tells of one of the phyſicians in his neighbourhood, to whom he had no particular liking; indeed the harmony betwixt the two profeſſions was in his days but very imperfectly eſtabliſhed. The ſervant girl of a public-houſe in his neighbourhood, at the ſign of the Swans, had fallen with a baſket of bottles, and cut her wriſt. After various attempts to ſecure the artery, and many terrible bleedings; after the ſurgeons and apothecaries of the neighbourhood had uſed their flour compreſſes, ſtyptics, vitriol buttons, &c. all in vain, every ſlough proceeding from the vitriols having brought on new bleedings, Turner at laſt, with the aſſiſtance of his neighbour Mr. Henry Boon, ſuppreſſed the bleeding with the actual cautery, which he ſeems, indeed, to have twiſted about and thruſt upwards under the tendons with very ſingular dexterity!

The girl entirely recovered. She fell ill of ſome ſlight indiſpoſition, and a phyſician, Dr. P—r, being called to viſit her, was carried up ſtairs to the garret to Betty's bedſide, where ſhe lay ſound aſleep. He took hold of her wriſt, examined it again and again, found no pulſe. Dr. P—r came down to the parlour, and declared the girl paſt all poſſibility of recovery. The family running haſtily up ſtairs, wakened the girl, to the great humiliation and confuſion of Dr. P—r.

diſtending it, we pile one compreſs above the other, till the whole riſes ſo above the level of the wound, that our bandage operates well upon the whole of this pile, which is called the Graduated Compreſs.

I adviſe you, on ſuch occaſions, to keep your tourniquet ſcrewed during the whole operation, that you may not be troubled with blood; to ſlacken it ſlowly, that the dreſſings may not be diſcompoſed by the too ſudden return of blood; and ſtill let your tourniquet remain looſe about the limb, and ready to be ſcrewed if the artery ſhould bleed again.

Yet once more, before I forſake this ſubject, I muſt endeavour to impreſs you with a conviction of the danger of entering upon the profeſſion of ſurgery (where all the moſt alarming accidents and trials come upon you ſuddenly) without a perfect knowledge of anatomy. From the earlieſt times this has been the conviction of the moſt eminent men; this is indeed a ſubject on which I ſhould chooſe rather to argue from authority, than to quote invidious facts. I ſhould not chooſe even to remind you of the murders which are related in books of the rude Arabian ſurgeons, yet that ſurely could give no offence. Albucaſis, in the preface to his book of ſurgery, relates many. He himſelf ſaw an ignorant ſurgeon, in opening a ſcrophulous abſceſs in the neck, cut the arteries, ſo that the woman fell down dead under his hands. "Surgery," ſays Albucaſis *, "has fallen to a very low ſtate. The art has in theſe regions degenerated, it is almoſt forgotten; and this is the reaſon why no good operators are found! Our art is difficult, and ſhould be attempted by no one who is not exerciſed in the ſcience of anatomy as taught by Galen, till he knows the forms and articulations of the ſeveral members, their bones, nerves, ſinews, with the place and number of each, and the courſe and egreſs from the body, both of the pulſating and of the quieſcent veins." Every artery, indeed, ſhould be thoroughly known to the ſurgeon, from the ſmalleſt, which are ſtopped by lint or compreſſion, to the greateſt which form the aneuriſm of the arm or thigh! from the arteries of the wriſt or temple, which you can hold with the point of one finger, and catch with the needle eaſily! to the arteries of

* "Quoniam operatio cum manu proſtrata eſt in regione noſtra, et tempore noſtro privata omnino. Donec fortaſſe periit ſcientia ejus, cauſſa autem propter quam bonus artifex de ejus cum manu ſua in hoc noſtro tempore eſt quia ars medicinæ eſt longa, et oportet auctorem ejus exercitari. Ante illud in ſcientia anatomiæ, quam narravit Galenus, donec ſciat juvamenta membrorum et ipſorum formas et eorum conjunctionem et ſeparationem et habeat cognitionem oſſium et nervorum et lacertorum et numerum ipſorum, et eorum egreſſionem, et venarum pulſatitium et quietarum et locorum exitus earum."

ALBUCASIS, in Chirurgiæ ſuæ Præfatio.

the groin or armpit, which bleed ſo, that the patient can hardly be ſaved by the moſt rapid and dexterous operation.

But let a man ſtudy with what diligence he will, anatomy can never be perfectly remembered. The ſurgeon ſhould from time to time reviſe the tables of the arteries. Drawings no doubt can be of little ſervice to thoſe who are not thoroughly ſchooled in anatomy; but to one who is, or who, during his ſtudies, has been an anatomiſt, anatomical tables are of ſingular uſe; they remind him of things which can be done, and of things which ſhould be avoided; they correct the errors of time and forgetfulneſs; they remind him of all that he had once known, and bring to his perfect recollection the manner in which he had formerly diſſected thoſe parts in the dead body, which he is now to approach in his actual operation; they give him ſteadineſs and confidence, and without ſuch a monitor the beſt anatomiſt might be at a loſs. Under the moſt perfect conviction of the importance of ſuch a book, I have long meditated a neat ſmall ſet of tables, with ſimple explanations, ſuch as might ſerve to remind a well educated ſurgeon of the principal arteries of the human body. One painful confeſſion indeed remains, I have promiſed ſuch a book too long, it is four years ſince it was announced; but I have now devolved the taſk on my Brother, who will do juſtice to my idea, and make a book which will need no commendation. It is a deſideratum in our profeſſion and will be anxiouſly expected; no ſurgeon, I believe, will chooſe to be without ſuch a book; my only anxiety is leſt it ſhould be ſtill delayed.

# DISCOURSE XI.

## OF THE ANEURISM FROM ANASTOMOSIS.

THAT kind of aneuriſm which I venture to name Aneuriſm from Anaſtomoſis, reſembles thoſe bloody tumors which appear in new-born children, occupying chiefly the lips, cheeks, eyelids, or hairy ſcalp, and which grow in proceſs of time to an important ſize, burſting at laſt, and bleeding furiouſly, ſo as to oblige us to cut them out.

The diſeaſe which I am now about to deſcribe ariſes, not from any ſuch natural deformity, but from various and hidden cauſes; it often begins in adults, increaſing from a trivial pimple-like ſpeck, to a formidable diſeaſe. This aneuriſm conſiſts in a mutual enlargement of the ſmaller arteries and veins. I ſhould call it cutaneous aneuriſm, were it confined to the ſkin, or aneuriſm of the hairy ſcalp if it were peculiar to that part; but it is an accident which affects indifferently all parts of the body, and brings on complicated diſeaſes even among the viſcera, not leſs frequently than on the ſurface of the body.

This tumor, which I call Aneuriſm by Anaſtomoſis, is a perfect aneuriſm. It ariſes from ſome accidental cauſe; is marked by a perpetual throbbing; grows ſlowly, but incontroulably; and is rather irritated than checked by compreſſion. The tumor has only a ſort of trembling or indiſtinct throbbing at firſt, but when it is fully formed, it has a continual, diſtinct pulſation; it beats ſtrongly upon every occaſional exertion; it ſwells up in ſpring and ſummer with a fuller and more active pulſation; it beats powerful in the time of menſtruation; and by the inceſſant pulſation and occaſional turgeſcence, it forms among the cellular ſubſtance, or among the dilated veins, ſacs of blood. Theſe little ſacs form apices and tender points, which become livid and very thin, and burſt from time to time, and then, like other aneuriſms, this aneuriſm pours out its blood ſo profuſely, as to reduce the patient to extreme weakneſs.

If the patient ſeldom die of this diſeaſe, it is, becauſe the aneuriſm being ſeated uſually in the ſkin, and being tender on its ſurface, theſe hæmorrhagies are foreſeen, and eaſily controuled. But to what extremity of weakneſs the patient may be reduced by theſe ſucceſſive hæmorrhagies, I ſhall preſently explain.

I believe I ſpeak modeſtly enough when I affirm, that this diſeaſe has been far too little noticed. It preſents itſelf everywhere in an infinite variety of forms, the ſurgeon, not aware of its nature, performs only very imperfect operations; he makes partial inciſions, his patient bleeds profuſely, he is confounded with the unuſual appearance of innumerable arteries, ſmall, indeed, but bleeding with intenſe impetuoſity, which nothing but a firm compreſs can ſtop. A firm compreſs is accordingly applied, the hæmorrhagy is repreſſed, the aneuriſm cloſes and heals again; again it begins its pulſations, diſtends, and burſts, and bleeds from month to month! the patient is exhauſted with loſs of blood, till at length his conſtitution and health are in danger of being entirely deſtroyed.

When from fear or ignorance we perform ſuch partial inciſions, we ſoon find ourſelves in danger from its former nature; "We've ſcotched the ſnake, not killed, and it will join and be itſelf again." The return of ſuch a diſeaſe (though doubtleſs the fault of the ſurgeon) is the reaſon why ſuch a tumor is often moſt unhappily pronounced a cancer! an incurable diſeaſe!

It is not without reluctance and diffidence that I venture to uſe a new name, and a hypothetical one, yet I know of no word by which I can truly expreſs the character of this tumor, except by this word ANEURISM FROM ANASTOMOSIS. I have cut round about ſuch tumors in the living body, and diſſected them out; I have ſeen others cut into the ſubſtance of thoſe tumors in the way of operation, thinking perhaps to obliterate ſome dilated veins or ſome particular artery; and finally, I have diſſected and obſerved ſuch tumors after they were extirpated, and cannot be entirely miſtaken in regard to their nature. The tumor is a congeries of active veſſels, and the cellular ſubſtance through which theſe veſſels are expanded, reſembles the cellular part of the penis, the gills of a turkey cock, or the ſubſtances of the placenta, ſpleen, or womb. It is apparently a very ſimple ſtructure that enables thoſe parts (the womb, the penis, the ſpleen), to perform their functions, and it is a very ſlight change of organization that forms this diſeaſe. The tumor is a congeries of ſmall and active arteries, abſorbing veins, and intermediate cells. The irritated and inceſſant action of the arteries fills the cells with blood, from theſe cells it is re-abſorbed by the veins, the extremities of the veins

themſelves perhaps dilate into this cellular form. There ſeems to be a perpetual circulation of blood, for there is an inceſſant pulſation; the tumor is permanent, but its occaſional variation of bulk is ſingular; it ſwells like the penis in erection, or the gills of a turkey cock in paſſion; it is puffed up by exerciſe, drinking, or emotions of the mind; it is filled and diſtended with blood upon any occaſion, which quickens the circulation, as by venery, menſtruation, the pleaſures of the table, heated rooms, or the warmth of the bed. This tumor beats continually, increaſes ſlowly, its ſurface burſts, it bleeds from time to time; its pulſation and hæmorrhagies give it a title to rank with aneuriſms, and its internal ſtructure is ſuch, that I may venture to name it, Aneuriſm from the Dilatation of Anaſtomoſing Veſſels.

I find that the veſſels in this diſeaſe ſeem to increaſe in number by increaſing in ſize; large arteries are, as it were, generated in parts where they were not known in the healthy ſtate. When this continued and irritated action of the veſſels is once fairly begun, the tumor works for itſelf, the circulation being occaſionally highly excited, while each paroxyſm of excited action not only enlarges the tumor for the time, but cauſes a permament enlargement. Every active artery encourages, ſupports, and urges on another to increaſed action, and multiplies the ſources from which the cells and veſſels of this mixed aneuriſm draw their blood! It is the frequent communication and anaſtomoſis of veſſels one with another that makes every inoſculating branch tributary to this active group of veſſels.

Such is the influence of the anaſtomoſis, or communication of veſſels, in generating, ſupporting, feeding, augmenting, this tumor, that I know of no name ſo proper as this of ANEURISM BY ANASTOMOSIS, to expreſs its nature: Nor indeed can any thing in the ſtructure or economy of the vaſcular ſyſtem account for the peculiarities of this tumor, its regular increaſe, its impetuous bleeding, or its intenſe pulſations, but this, that it receives the force, not of one or two principal arteries which lead towards it, but of innumerable ſmall branches into which thoſe larger arteries are divided, and which in their turn inoſculate with other arteries ſtill ſmaller and more diſtant, ſo as to bring in blood from all ſides, and to poſſeſs infinite ſources of blood. The activity of the group of veſſels in the centre conſtitutes the main diſeaſe, and though you interrupt by ligature, all the more conſpicuous branches which lead to it, that central group, while it continues active, will have blood.

This aneuriſm, in its beginning, is extremely ſmall, it is a mere ſpeck of diſeaſe; but it is a portentous one. I have reaſon to believe that it ſometimes originates from ſo ſlight a cauſe as a tight hat or a trifling bruiſe; it frequently begins in adults, in pure, hale, and ſound ſkin, where no ſpot, nor mark, nor tendency to diſeaſe, had ever been obſerved. The marks which children are born with are often ſuperficial ſtain-like ſpots, which never change, except that their colour becomes occaſionally deeper. But ſometimes thoſe ſpots are alſo defects in the ſubſtance of the ſkin, they are a ſpecies of aneuriſm, or they create a tendency to this diſeaſe; and from almoſt imperceptible ſtain-like ſpots, not elevated above the ſurface of the ſkin, they grow to dangerous bloody tumors, which require extirpation.

In both diſeaſes, viz. of connate aneuriſms appearing, when the child is born, in the form of a ſmall livid tubercle! and of thoſe forming ſpontaneouſly or ariſing from a blow, the proceſs of their growth and increaſe is the ſame. When a ſet of cutaneous veſſels firſt enter into this diſeaſed action, a few of the extreme arteries in the ſkin itſelf are originally in fault, and commence an increaſed action, which draws the arteries of all the adjoining parts into ſympathy with them; the arteries behind them convey more blood and puſh it on rapidly; theſe larger arteries begin to feed the diſeaſe, while the central group thus ſupported by the arteries behind, acts powerfully, the tumor begins its pulſations, and, like a punctum ſaliens, forms veſſels as it were, by enlarging thoſe ſmall branches which were not viſible before. The little arteries work powerfully and are dilated, the correſponding veins are proportionably enlarged, the number and activity of thoſe arteries and veins are ſlowly increaſed. This increaſed circulation ſolicits more blood towards the tumor; and while the central branches impel their blood with greater rapidity, the trunks they come from, follow up that action and work ſo as to keep them full. It is thus that the ſmall arteries work upon their correſponding veins, the trunks in their turn work upon thoſe ſmaller arteries; action follows action, and indeed it were as impoſſible for the arteries of a part to act powerfully without drawing into conſent and ſympathy all the adjoining veſſels, as for the heart to be enlarged in diſeaſe without a correſponding enlargement of the great veins through which it draws its blood.

Thus we have reaſon to believe, that the doctrine of derivation and revulſion is not ſo great a blunder in phyſics as was once ſuppoſed. It is true even in a ſyſtem of rigid tubes; but its influence in the active arteries of a living body is

very great. Wherever increaſed action and quick circulation begin, blood will follow; and wherever the circulation is thus hurried and irritated, the veſſels, and the cellular ſubſtance ſurrounding the veſſels, will enlarge. This is the reaſon why menſtruation, paſſion, wine, and other excitements have ſuch influence over thoſe tumors; and it is the reaſon why the increaſe of ſuch tumors is as ſure and uniform as the regular growth of the body. This is the reaſon why, when in the ſcalp (where many arteries of equal ſize inoſculate very freely) any tumor of this kind begins, the diſeaſe ſpreads from artery to artery till the whole ſcalp is ſtudded over with ſmall aneuriſmal tumors, throbbing and enlarging till the ſurface of the ſcalp is as irregular as that of an aneuriſmal limb, and its ſubſtance like a pulp of extravaſated blood *.

In women, the phenomena of theſe tumors are very remarkable; the hæmorrhagy from them uſurps the place of menſtruation, the action of their veſſels is as regularly periodical as that of the arteries of the womb. The ſtate of menſtruation is a ſtate of general excitement, and the particular action may be turned off towards any ſet of veſſels, as thoſe of the ſtomach, noſtrils, or lungs. The excitement of menſtruation affects the breaſts, it is felt through the whole ſyſtem, its effect on every tumor is remarkable! and I am daily provoked at ſeeing cancers, even of the breaſt, (which is always peculiarly affected), and other tumors which actually riſe and fall with each menſtruation, extirpated without the ſmalleſt regard to the menſtrual period, though the change at ſuch a time upon every tumor is ſuch as the moſt ignorant obſerver might remark. The diſeaſe which I am now explaining, this aneuriſm from anaſtomoſis, conſiſts in the increaſed

* We had a patient in our hoſpital whoſe head was covered from the brow to the neck with a ſucceſſion of aneuriſms, ſmaller and larger, ſome like beads, and ſome very large. Schenkius relates ſuch a caſe in the following terms:

CAPITIS ARTERIÆ, A VERTICE AD OCCIPITIUM USQUE CUIDAM IN TANTUM DILATATÆ INTUMUERUNT, UT VARICUM SPECIEM REPRÆSENTARENT.

Intumeſcunt interdum arteriæ, et fiunt in illis veluti varices, quod tamen raro accidit: nam ob duplicem tunicam, quam duriorem habent et craſſiorem, et ob ſanguinem tenuem, quem continent, renituntur, et non ita facile dilatantur. Vidimus tamen Alexandrum Boſcollum, civem Florentinum, cui ARTERIÆ CAPITIS A VERTICE AD OCCIPITIUM ADEO TUMIDÆ ERANT, ut viderentur varices in gentes: pulſabant autem vehementer cum tangebantur. Venit hic piſas ut curaretur à Gabriele Falloppio: qui magno cum apparatu ſectionem pollitus, cum manum jam inciperet admovere, perterritus magnitudine tumoris curatione ſupерſedit: veritus ne homo vitam cum ſanguine redderet ille autem cum ejuſmodi defectu diu vixit. Vide Vidus Vidius, Part II. ſectio 2. lib. 6. cap. 14. Medicinæ.

action of certain arteries; and the menſtrual excitement, and the local action coinciding, cauſe periodical pulſations, periodical enlargements of the tumor, periodical hæmorrhages, and a burſting of the tumor at each menſtruation, which alternations I have known continue for many years.

Thus I find it neceſſary to appeal to that doctrine of inoſculations which I have formerly delivered. I am perſuaded that you will feel the neceſſity of ſome theory to connect in your own mind the phenomena of this diſeaſe, whoſe anomalies are ſuch as muſt be left to your own ingenuity to explain. I have endeavoured to ſettle the character and diſtinction of this ſingular ſpecies of aneuriſm, and after having initiated you into the theory of this diſeaſe, I ſhall proceed to relate, in the firſt place, a pure unencumbered caſe.

Mr. R—n, a young gentleman of about twenty-five years of age, had an aneuriſmal tumor upon his forehead, which had been growing for ſeven years. It began with a ſmall ſpot like a pimple, of the ſize of a pea, and was, when he conſulted me, of the ſize of an egg; there paſſed along the centre of the tumor the ſcar of an operation which had been performed about a year before. Nothing could be more ſingular than the circumſcribed form, ſtrong pulſation, and various peculiarities of this aneuriſm. Nearly ſeven years before, he had firſt obſerved a ſmall pimple-like tubercle riſe on his forehead (which had hitherto been ſmooth and ſound), which was ſeated cloſe upon the eyebrow, and was ſo ſmall and ſo little troubleſome, that he believed it to be a pimple merely, aſcribed it to the tightneſs of his hat, and diſregarded it for ſome time. When he conſulted a phyſician of very excellent abilities, Dr. Cleghorn of Glaſgow, that gentleman ordered gentle phyſic, and other trivial preſcriptions, in perfect confidence that it would diſappear; for at this time it was of the ſame colour with the reſt of the ſkin, had no character of aneuriſm, and was ſo little troubleſome, that it was for a long while after entirely diſregarded. But when it had attained to the ſize of a ſparrow's egg, he thought he felt pulſation in it at times, he began to be alarmed; and when at laſt he reſolved to conſult a ſurgeon, the pulſation was manifeſt, the ſurgeon recognized it as an aneuriſm, and adviſed that it ſhould be cut out, but not with that earneſtneſs which is neceſſary to perſuade a patient, who ſeldom has at firſt a ſerious impreſſion of the nature or conſequences of ſuch a diſeaſe. Mr. R——n adviſed, or rather talked, with others, but in ſo careleſs a way, that he began to be himſelf indifferent about the tumor, was eaſily prevailed upon to believe that if it increaſed at all, it muſt be very ſlowly; this little tumor ſeemed at firſt to

have ariſen merely from a tight hat, and he was eaſily perſuaded to hope that it would go away.

One gentleman directed him to try compreſſion, and accordingly, a plate of lead was bound firmly down upon the tumor; he ſuffered the pain of this preſſure with great conſtancy for ſome days, and for ſeveral weeks he continued a leſs painful degree of preſſue; but finding the aneuriſm beating more powerfully, foreſeeing no good effect, and irritated with the conſtant and ineffectual trouble of ſupporting the preſſure, he threw away the bandage, and let the aneuriſm grow as it pleaſed. This was about ſeven years ago; during five years had his tumor continued to grow, when the nature of it being no longer equivocal, and the conſequence of allowing it to increaſe, much to be feared, it was reſolved to perform the operation. There is every apology for the theory which the ſurgeon had imagined of this tumor, for its form was very ſingular. It was ſeated immediately over the eyebrow, and was about the ſize of a ſmall egg; it lay exactly in the courſe of the frontal artery. The ſmall orbitary artery was found entering into the lower end of this oval tumor, while a branch of the temporal artery, remarkably enlarged and tortuous, went curling along the temple and paſſed alſo into the upper end of the tumor. No other veſſels, neither arteries nor veins, could be traced to it, but theſe two arteries, and the intermediate tumor beat in concert; the arteries beat much more powerfully than in their natural ſtate, and the tumor had a very powerful throbbing. This tumor, which became turgid whenever the pulſes beat ſtrong, ſeemed to be merely an enlargement of the frontal artery, (vid. fig. 1. p. 465.) and under this apprehenſion was the operation arranged as follows: The ſurgeon firſt made an inciſion in the lower part of the tumor, and paſſed a ligature under the orbitary or frontal artery; but when he had tied this artery the pulſe of the aneuriſm was nothing abated. He next made an inciſion along the temporal branch, where it ran into the upper part of the tumor, and tied it alſo with a ligature, but in vain; the pulſation of the tumor was ſtill unaffected. It was then neceſſary to operate upon the tumor itſelf; it was opened its whole length, and bled very profuſely; one ligature only was uſed, that ligature was ſtruck with the needle into the centre of the tumor, where there was one artery larger than the reſt; but from all the ſurface beſides there was one continual guſh of blood; the hæmorrhagy was repreſſed, and the wound bound up with a compreſs and bandage. The tumor in ſhort was thoroughly cut open, but it was not cut out. It healed ſlowly, the ligature came away with difficulty; after a fortnight

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the patient was left to dreſs the wound himſelf; he felt diſtinctly, before the wound was healed, that the pulſation had begun again; the pulſation became very ſtrong, and the tumor, by the time the wound was actually healed, had attained the full ſize it had before the operation; it was indeed rather larger than before.

But it might eaſily have been perceived, that this could not be a mere dilatation of the frontal artery, for the tumor was ſome thouſand times the diameter of that artery. The preſſing the point of the finger upon both arteries ſtopped their pulſation, but did not in the ſlighteſt degree affect the tumor; and ſince the ſtriking a needle and ligature under each artery, did not affect the pulſe of the aneuriſm, it was plain that the tumor was of ſuch a nature, as to draw its blood from a variety of ſources, and that it was neceſſary, not to cut it open, but to cut it out.

For nine months longer the tumor was ſuffered to grow unmoleſted. When Mr. R—— firſt deſired my advice, the character of the tumor was very ſtrongly marked.

It was very protuberant from the forehead, of a regular oval form, about the ſize of a ſmall hen's egg. The ſcar of the former operation, about three inches long, ran acroſs the centre of the tumor. The tumor was not purple on its ſurface, like the fleſh ſpots of children, it was covered with a firm and ſound ſkin; the ſcar was white, the reſt of the ſkin was of a deep red, from inflammation, and not from the blood appearing through it; its throbbing was exceedingly ſtrong, and of late it had become very painful, ſo that he was in fear of the burſting of the tumor, or the corruption of the bone; it was from the pain, which had of late been conſiderable, that he was inclined to aſk advice, or to ſubmit to a ſecond inciſion. The notes taken at this period, in relation to the appearance, ſize, and pulſation of the tumor, are as follows:

The lower artery, the occular, which comes from within the orbit, is very large, and is felt entering into the lower corner of the tumor; the temporal branch is very greatly enlarged, is remarkably tortuous, pulſates with great force, ſo that I am ſurpriſed it has not wrought out other aneuriſms near this firſt one. He wears his hat quite off his face; when his hat preſſes upon the tumor, it increaſes in ſize. When he runs, when he is heated, when he ſtoops, when he breathes hard, it increaſes in ſize, and its pulſations are very ſtrong: When he drinks ſpirits or wine, it ſwells, pulſates, aſſumes a deeper tinge, and every perſon at table can perceive the change; and when I handle it rudely, it ſwells up,

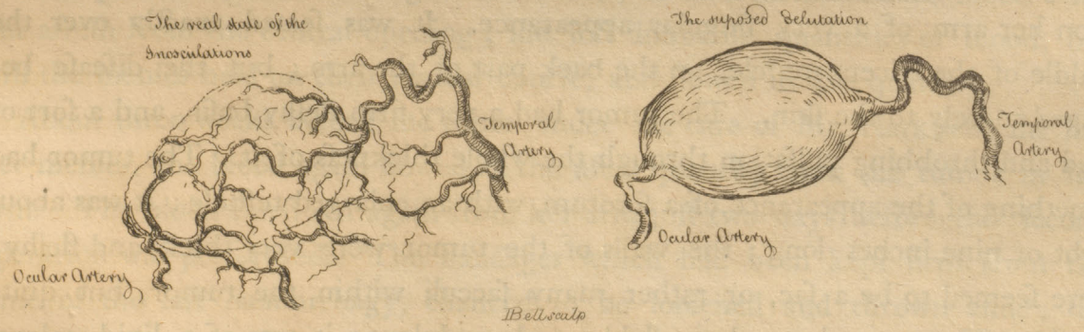
and when he chooſes to retain his breath, it is inflated like the gills of a turkey cock. It is only for ten days that the throbbing pain has been remarkable, but that pain increaſes, and as it runs backwards along the courſe of the artery, it is, by compreſſing the artery, in ſome ſlight degree relieved.

The nature of this aneuriſm is expreſſed in the ſecond figure of the marginal plate, page 465. where (a) marks the occular artery; (b) the dilated and tortuous branch of the temporal artery; and (c) marks the manner in which thoſe arteries ſpread before they enter the tumor; while (d d) mark the Anaſtomoſis with various other branches. Were this aneuriſm a mere dilatation of one artery, it ſhould be emptied at once by compreſſion, and the continuing of that preſſure, ſhould prevent its being filled again. But when it is compreſſed firmly, it yields very gradually, as if the veins received its blood; the compreſſing of its two great arteries, does not prevent its filling again; you are able to ſuppreſs their pulſation, but the aneuriſm ſtill pulſates, it throbs from the bottom, it riſes very gradually when you ceaſe from preſſing, and ſoon fills to its full ſize; it ſeems to receive its blood from one knows not what ſources, from ſmall arteries which cannot be perceived. The ſudden inflation of this tumor, like the gills of a turkey cock, its various fulneſs, according to the ſeaſon of the year, its falling in autumn when the blood is low, and its riſing in the ſpring when the circulation is rapid, the variations of it in reſpect of fulneſs, and its colour varying according to the degree of turgeſcence, its ſudden puffing up upon taking wine or uſing exerciſe, its ſlow ſubſiding, and yielding in ſome ſlight degree by preſſure, and its being ſo little affected by compreſſing the great artery which feeds it, are ſufficient indications of its nature. All this proves, that it is a tiſſue of ſmall arteries and veins, it fills not like a varix, ſlowly, there is, indeed, no dilated vein to be ſeen near it; its filling is by diſtinct throbs, it is filled by its ſmall and numerous arteries, and its ſwelling is (like the erection of the penis) produced by the pulſations of the arteries, ſtroke after ſtroke, pouring out their blood into the cells.

With this view of its nature, I was ſure that it was a kind of tumor which was not to be cut open, but to be cut out. Dr. Jeffrey, and Mr. Cooper ſurgeon in Glaſgow, had the goodneſs to aſſiſt me. I tied this rampant temporal artery before touching the tumor, that it might be once more aſcertained how little this interruption of any one artery could affect ſuch a tumor. The pulſation of the tumor was nothing affected; I knew by this what ſort of an enemy I had to deal

with ; I knew, that if I cut within the active circle of this tumor, I ſhould have innumerable branchings of the artery to tie up ; but that if I cut wide where the arteries were undivided, and before they had formed their anaſtomoſis, I ſhould have to deal with but one or two. I diſregarded the bleeding, I knew that I had no means of ſaving blood but by making the operation rapid. I made an oval inciſion which comprehended about a fourth part of the ſurface of the tumor ; diſſected the ſkin of each ſide down from it rapidly ; I went down to the root of the tumor, and turned it out from the bone. The tumor was a perfect cellular maſs, like a piece of ſponge ſoaked in blood ; it was tolerably ſolid, and diſſected out very clean, in the form of a regular tumor ; it bled furiouſly during the operation (that I had reſolved to diſregard), but the moment the tumor was turned out, there was not one drop of blood, the ſurface was clean, the pericranium quite bloodleſs, the lower artery ſtood wagging out of its hole in the orbit, and I held it with the hook while Dr. Jeffrey tied it. The upper tortuous artery was alſo tied ; the eyebrow, which was divided exactly in the middle, was brought nicely together, the inciſion healed in ten days ; the wound has been now two years healed, and the ſcar is ſmall, reddiſh, and very little perceptible, and the two extremities of the eyebrow, which were two inches diſtant in the time of the operation, are perfectly cloſe.

Plans of the Aneurism of the Forehead




But there are varieties of this diſeaſe, which nothing but a variety of caſes can explain ; and one conſideration ſhould give us a particular intereſt in inveſtigating its nature ; that if neglected, it becomes incurable, and when it is incurable, I think it cannot fail to be in time fatal. It becomes incurable, when having been operated upon with a partial inciſion, inſtead of being extirpated, it is but irritated, and grows till it ſpreads its roots among the adjacent parts. It becomes

incurable when it occupies a great extent of ſkin: It is an incurable diſeaſe when it affects any of the viſcera. One phenomenon of this diſeaſe, I think, is very remarkable; often in the courſe of this diſeaſe various ſacs are formed, which receive ſometimes ſerum and ſometimes blood, according to the ſtate of the tumor, ſo that tumors of this kind ſometimes burſt like a ganglion or great ſalivary tumor, diſcharging a thin ſerum like ſaliva. There is alſo another ſingularity, that always, in women, the riſing and falling of this kind of tumor has a curious connection with the menſes, and the regular and monthly hæmorrhagy, from this tumor, frequently ſuperſedes the menſtrual diſcharge.

This kind of aneuriſm ſometimes grows in the limbs, and to a very remarkable ſize; bleeds profuſely, and reduces the perſon to extreme weakneſs, and yet is eaſily cured; for the rule which I have laid down, gives you a perfect command of this aneuriſm. You muſt not cut into it, but cut it out. If you merely cut into it, the hæmorrhagy is terrible, and the cure imperfect; if you cut round it, and at a little diſtance from its root, in place of the profuſe hæmorrhagy, from numberleſs arteries, you have but a ſlight bleeding from one or two, which are extremely ſmall.

A tumor of this kind, which had grown to a remarkable ſize, and done infinite injury to the conſtitution of the patient, was extirpated by my friend Mr. Harkneſs. The hiſtory of it is as follows:

" Jean Smith, a houſe ſervant, about thirty-nine years of age, had a tumor upon her arm of a very ſingular appearance. It was ſeated exactly over the middle of the triceps muſcle, on the back part of the arm; but the diſeaſe belonged merely to the ſkin. The tumor had a very firm fleſhy baſis, and a ſort of dead and throbbing pulſation through the whole thickneſs of it. The tumor had ſomething of the appearance of a ſcrotum, with an enlarged teſticle: It was about eight or nine inches long; the walls of the tumor were very thick and fleſhy; there ſeemed to be a ſac, or rather many ſacculi within the tumor, but quite flaccid. The tumor hung down flabby and pendulous; it was of a livid colour, as if it contained blood, or the remains of blood; where it was not blue like a vein, it was mottled of a deep red, or lakey colour. This tumor had burſt often and poured out prodigious quantities of blood, and at the place where it had burſt, and eſpecially at one point, where the blood had always of late been poured out, the ſurface of the tumor was covered with thick white ſcabs, as if the bleeding orifices had been plaſtered up.

The hiſtory of the tumor was ſingular. It was about eighteen months before, that there had appeared a ſmall purple ſpot upon the back of the arm, which ſoon grew into a tumor. The tumor enlarged ſlowly, and had, in the courſe of five months, attained to the ſize of a hen's egg; then, for the firſt time, it burſt and diſcharged a great quantity of blood. The blood was red and florid, and thrown out with great impetus; but it ſtopped of its own accord. It increaſed in ſize from this time forward very rapidly, and in four days more it was thought neceſſary, by the ſurgeon in the country, to open the tumor. This was done by inciſion; there had been a ſac formed, even at this time, a great quantity of coagulated blood was taken out, the hæmorrhage was very profuſe, from the whole ſurface, but no particular artery was ſeen. No veſſel great or ſmall was taken up, the hæmorrhagy was ſtopped with flour, firm compreſſes, and bandage. The wound was healed, the tumor grew, and from the ſize of a hen's egg, it increaſed in a few months to its preſent dimenſions, of eight or nine inches in length, and ſix or ſeven in breadth.

But this inciſion never healed entirely; a ſucceſſion of ſcabs formed upon that part of the tumor, and from time to time the blood burſt out from it on the ſlighteſt accident or injury, and moſt infallibly the hæmorrhagy returned at every menſtruation.

Her menſes continued regular; at every menſtrual period ſhe was ſenſible of a heat, pulſation, and ſwelling in the tumor; at each menſtruation, blood burſt out afreſh from the central opening; ſhe loſt immenſe quantities of blood, but ſtill the menſes held on their regular courſe, and flowed in due quantity.

About three weeks before ſhe came under the care of Mr. Harkneſs, ſhe had her menſes, the blood again flowed in the uſual quantity from the tumor in her arm. The blood burſt out again from her arm juſt two days before this ſecond operation was performed. The bandages which had been kept firm from the time of the laſt hæmorrhagy, chanced to be looſened and thrown aſide; the blood, on the day of menſtruation, and juſt two days before the operation, burſt out impetuouſly, and ſhe loſt no leſs than four pounds of blood *.

Operation.—This hæmorrhagy was ſo dangerous, and implied alſo ſomething ſo peculiar in the nature of the tumor, that Mr. Harkneſs very prudently called together a full conſultation, eſpecially of the older ſurgeons. The tourniquet

* At this time ſhe had begun to have conſiderable pain in her arm.

was applied, the foul cloths and tight bandages were taken away from the tumor. It hung like a thick and maſſy bag half empty. Mr. Harkneſs did not ſet about the operation without a degree of apprehenſion, nor were the gentlemen who were convened to ſee the operation without fear of a very troubleſome hæmorrhage. Mr. Harkneſs went round the baſe of the tumor with two ſtrokes of his knife; he ſeparated the tumor very rapidly; when the tourniquet was ſlackened, there was not the ſmalleſt hæmorrhage; the place where the tumor had been, remained almoſt clean of blood; one ſmall artery bled ſmartly, and was taken up with the tenaculum. Thoſe who had ſeen the alarming hæmorrhagy of the preceding day, were aſtoniſhed, while thoſe who ſaw the tumor for the firſt time, and had been called together as to an important caſe, were almoſt offended to find themſelves ſo formally ſummoned to attend on an occaſion of ſo little danger *.

A tumor in a part like this, though imperfectly cut, is ſtill curable; had it extended itſelf, even along the whole arm, it might ſtill have been cut away. But a tumor of this nature, ſeated on the head, or about the jaws, and mangled with an imperfect inciſion, becomes exceedingly dangerous; it is long before a perſon who has ſubmitted himſelf to an unſucceſsful operation, will expoſe himſelf to another attempt, which, in particular circumſtances, is not altogether ſafe.

Mr. N— had a child born to him at the full time, very ſtrong and healthy, but with a ſmall dimple or ſpot upon the right temple, of a livid colour, flat, more like a ſtain than a tumor. It was about the ſize of a ſixpence, and totally void of pulſation. But this portentuous ſpot, when the child was about a twelvemonth old, began to change its nature. It roſe more prominent in the centre, it was like a ſmall berry, purple, ſoft, and very tender; and upon the ſlighteſt touch it would bleed, not like a fretted ſore, but very profuſely like a vein. Even the ruffling of his nightcap burſt the tumor; the parents were kept in unceaſing alarm, leſt (as often happened) it ſhould burſt during the night and bleed the child to death. They watched him with inceſſant care, and had a compreſs and bandage, with a piece of lead in it always ready, and with which they repreſſed the bleeding.

The child was about a year old when the tumor began to bleed, and the pul-

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ſation began in it about the ſame time; and when he laughed, or cried, or coughed, or ſtruggled with his feet and hands, the tumor ſuddenly puffed up with a perceptible motion. At ſuch times, the ſlighteſt touch made it bleed, and in the moment of burſting out, the blood flowed in a full ſtream, which often darted to the diſtance of a yard.

This ſtate of anxiety the parents endured patiently for four years, when the tumor was greatly extended; it now covered two inches or more of his temple; the pulſations, when the boy was vexed or heated with exerciſe, were very ſtrong, and the bleedings were frequent and very profuſe; ſo that the child was at times quite blanched with the loſs of blood. But he was now grown up to ſtrength, and they reſolved to ſubmit their child to an operation, not to remove a deformity, but really to ſave his life.

A ſurgeon of very conſiderable knowledge in his profeſſion, performed this operation; I aſſiſted him, and had an opportunity of ſeeing the nature of this tumor, and the effect of cutting into its ſubſtance. The appearance was very ſingular indeed. A ſufficient number of needles, tenaculums, and hare-lip pins were provided, not one of which, can in any ſuch operation, be of the ſmalleſt uſe. The inciſion was made directly along the middle of the tumor; the firſt inciſion was accompanied with a guſh of blood, as if a bag of blood ten times the ſize of this tumor had been cut into. The blood continued to ruſh out impetuouſly; we were all covered with it, and the child ſtruggled very violently. The operator then cut down into the centre of the tumor; he cut quite down to the bone, hoping to come at ſome great veſſels which fed the aneuriſm, and the two ſides of the tumor were now held apart with hooks and forceps to let him uſe his needles. The appearance was very ſingular, and muſt have been very confounding to a perſon who began the operation with any hopes of finding one or more remarkable arteries. For, although the tumor, before the operation, was eaſily flattened, as if it had been a mere dilated vein or ſome ſac of blood, there was in truth no ſac, great nor ſmall; the whole ſubſtance of the tumor (even in its very centre, and under the point where it was moſt particularly livid and thin) was perfectly cellular. The ſubſtance of it was cellular, ſtringy, and expreſsly reſembling the corpora cavernoſa penis; it was uniformly cellular, and ſingularly firm; thoſe cells were filled with blood from the arteries, the arteries entered into the tumor in all directions, ſo that no preſſure could command them, and the little arteries being all cut directly acroſs in the centre of the tumor bled each of them from both

ends; ſeven or eight ſmall arteries bled from the oppoſite ſides of the tumor; the ſtreams of blood, which were very ſmart, croſſed and interſected each other in every direction; the arteries bled abſolutely like the ſpout of a watering-pan, while the dark and denſe blood of the veins run in a full ſtream down the face, choking the boy while we held his head firm upon the pillow.

The needle was ſtruck under one of the largeſt arterial mouths, but without effect; it was now eaſy to foreſee that ligatures could be of no ſervice, the corner of a ſponge being cut into a proper ſhape, was thruſt down into the inciſion, and ſupported with compreſſes, and fixed with a bandage. There was ſome reaſon to hope (though very ſlight indeed) that a tumor which had been ſo thoroughly opened, might be gradually deſtroyed by cauſtics. The gentleman who performed the operation, continued for many weeks to uſe, in various ways, the cauſtics, compreſſes, ſponges, and the bandage, but all in vain; the tumor, even before it was healed, had acquired its former ſize, and the moment the bandages were relaxed, it ſwelled again. While they were continually occupied with the cure of the ſore, and applied the bandages night and day, the aneuriſm was no doubt prevented from bleeding; but no ſooner was the boy allowed to go to play with his companions and little brothers, than it burſt out again, it bled now as profuſely as ever; many a time they were alarmed for his life, the bloody ſcenes that paſſed for two or three years were very diſtreſſing to the parents.

This boy is now ten years of age, of a fair complexion, healthy and active; the hæmorrhages are leſs frequent, he has loſt no blood for theſe three months, and his father is flattered with the hopes of the diſeaſe changing when he comes to a certain time of life; but this cannot happen! the tumor is increaſing ſo much, that it now covers four inches of his cheek; it is widening its baſis, and the baſis is growing more and more ſolid. When the boy runs, cries, or laughs, it riſes very high, beats ſo as to be ſeen at a conſiderable diſtance; and he ſays, that when the maſter leaves the ſchool for a moment, and the boys make a noiſe, it beats terribly, and frightens him very much; and that when he is playing at hide-and-ſeek, it beats ſo that he is frightened at it!

In examining this aneuriſm, now at the diſtance of five years from the operation, I find the temporal artery, and the tranſverſe artery of the face, enlarged, and running into the tumor at the upper part and ſides; but upon putting my finger into his mouth, and feeling the whole thickneſs of the cheek, I am not ſenſible of any remarkable artery entering from that ſide. When I preſs the tu-

mor with the palm of the hand, I find that I can flatten it almoſt entirely; it is repreſſed by ſlow degrees, it riſes again very ſlowly; but before you can count two hundred it has riſen to its ſtationary ſize. It is only when I tickle his ſides, and make him laugh immoderately, that I can ſee it of its full ſize, or perceive its pulſation. This boy's aneuriſm is manageable ſtill, but in a little while I fear it will ceaſe to be ſo; and when puberty arrives, I am apprehenſive there will be a very unfavourable change.

When ſuch tumor is ſeated among the viſcera, or in any inacceſſible part, it muſt be an incurable, and in the end a fatal diſeaſe.

"A young woman about twenty-five years of age, who was bred a milliner, lived a ſober, quiet, induſtrious life, and is now married to a young man, a carpenter, of reſpectable character. When ſhe was about nineteen years of age, ſhe had the influenza, and felt all the weakneſs and languor which ſucceeds that diſeaſe. But it left behind it a more laſting malady; for ſoon after the influenza was gone, ſhe began to feel a degree of uneaſineſs towards the rectum; then ſhe became ſenſible of a tumor; and when it was firſt examined with the finger from the vagina (for this tumor lies in the middle betwixt the rectum and the vagina), it was about the ſize of an egg, ſoft, puffy-like, yielding like dough to the finger, and having a very ſenſible pulſation."

"This tumor ſeemed to grow very ſlowly, but the more ſhe was obliged to conceal ſuch a diſeaſe, the more was ſhe alarmed; ſhe felt it beating within! ſhe was ſenſible of its being enlarged in ſultry weather! ſhe was ſenſible of its being affected by menſtruation! ſhe felt it beating very ſtrongly when ſhe got warm in bed; it kept her awake with fear and anxiety, and its pulſation was at all times alarming. During its ſlow growth, it has given her little pain, except when going to ſtool; for the fæces are always long delayed, and ſhe paſſes them with difficulty; ſhe has been always coſtive, and often much pained."

"She was married about three-and-twenty years of age, i. e. about five years after the commencement of this diſeaſe. The growth of this aneuriſm had been hitherto extremely ſlow; but when in the ſecond year of her marriage, ſhe fell with child, the midwife, who was early conſulted on account of this alarming tumor, could obſerve a very ſenſible and rapid increaſe! and in the moment of delivery, the tumor was puſhed, in ſome degree, before the head of the child. As a firſt labour, her delivery was naturally ſlow, but the tumor had no ſhare in cauſing this lingering labour; it was partly compreſſed, partly protruded before

the head of the child, ſhe was ſafely delivered, and the tumor retired again, and ſhe recovered in the uſual time, though the appearance of ſuch a tumor greatly alarmed her midwife and friends."

The tumor is plainly this aneuriſm by anaſtomoſis. I have obſerved it in various ſtates, and can give a very full account of its condition.

While this tumor lies ſtill within the pelvis, it ſeems to belong to the walls of the rectum; it lies betwixt the rectum and vagina; but its chief bulk is towards the left ſide, where it lies broad and flat againſt the ſide of the pelvis, reſting upon the branch of the os iſchium. The firmeſt part of the tumor is felt towards the verge of the anus, and towards the left ſide of the rectum; upon introducing one finger into the rectum, and the other fore-finger into the vagina, the tumor is felt betwixt them, throbbing very powerfully; upon examining deliberately and long in the vagina, you can obſerve, that the whole of the tumor is in ſome degree compreſſible and ſoft; that it is throughout irregular, knobby, and glandular-like; but the knobs are not hard. In the interſtices of thoſe knobs, it feels ſoft and doughy; the ſoft parts allow you to preſs your finger deep betwixt the knobs; the knobs themſelves are in ſome degree painful on being preſſed. But while the head of the child was paſſing, the tumor could be ſeen, at leaſt the lower part of it; and it ſeemed to range along, from the lower part of the labium to the left ſide of the anus, protruding the verge of the anus and the inner ſurface of the labium. The lower hæmorrhoidal arteries, and the great pudic arteries, are the chief veſſels in this aneuriſm; but there are others of ſtill more importance; for while you feel, by introducing the finger, a powerful general pulſation, you feel, by examining carefully with one finger, firſt, two or three long arteries, pretty large and tortuous, running along the walls of the rectum and vagina, towards the left ſide of the pelvis, and plunging into the ſubſtance of the tumor; and by preſſing the finger deep betwixt the knobs, little arteries can be felt creeping betwixt the knobs.

The nature of this diſeaſe I need not now explain; the conſequences of it, God knows! Theſe notes of the ſtate of the tumor I took five years ago; ſince then, ſhe has had a ſecond child, has had but poor health, is of late fallen very low; and her huſband has called to beg that I would viſit her, on account of continual heavy pain, want of reſt, extreme weakneſs, and a hectic diſpoſition; and now, partly from weakneſs, partly from low ſpirits, ſhe lies almoſt continually in bed. I find the aneuriſm remarkably increaſed in ſize; but it is quite concealed

within the pelvis. Though none of the tumor projects, there is a general ſwelling of the labiæ and perinæum; and by laying your hand along this ſwelling, you feel the pulſation very ſtrongly from without. The long arteries which feed the tumor, and which I had planned in my note-book, I no longer feel; the increaſe of the tumor has raiſed thoſe arteries higher in the pelvis, and carried them out of reach of the finger; but the ſmaller arteries creeping betwixt the ſeveral tubercles, I feel more diſtinctly than before.

We cannot now be at any loſs to explain, what has hitherto appeared incredible, viz. the caſes related by old authors, of the beſt credit, of pulſating ſpleens, the throbbing of whoſe arteries could be eaſily felt through the cartilages of the falſe ribs! Which of the viſcera ſhould be ſo liable to this diſeaſe as the ſpleen, where the moſt careful inveſtigation of phyſiologiſts has diſcovered nothing except a rapid circulation of blood, for purpoſes which they have never been able to divine? In the ſpleen, there are large arteries and numerous veins, and intermediate cells perfectly regular, receiving and actually containing the blood; the ſtructure of this organ is unlike that of any other part of the body, unleſs, indeed, it reſemble that of the penis, or placenta, or of the pregnant womb, or this unnatural ſtructure, this very diſeaſe which we are now deſcribing. Tulpius deſcribes a man's ſpleen as pulſating ſo ſtrongly, that, like a violent palpitation of the heart, it could not only be felt, but heard. The patient was a poor labouring man; and Tulpius one day giong to viſit him, along with Henricus Salius, a phyſician, they both heard the pulſation of his ſpleen at the diſtance of thirty feet, and that ſo diſtinctly, that they could count the pulſe as fairly by the ear as by the finger *.

* "Et quidem tam diſtincte: ut numeraverint non ſemel ſingula verbera, et admota manu etiam coram tetigerint, quoſcunque, ferientis lienis, ictus.

This kind of aneuriſm is incurable, not in thoſe caſes alone where it is connected with internal parts, but alſo when, although occupying an external ſurface, it is of ſuch extent, that no operation can be performed. Of this kind was the aneuriſm of a man, whoſe caſe I ſhall relate in few words.

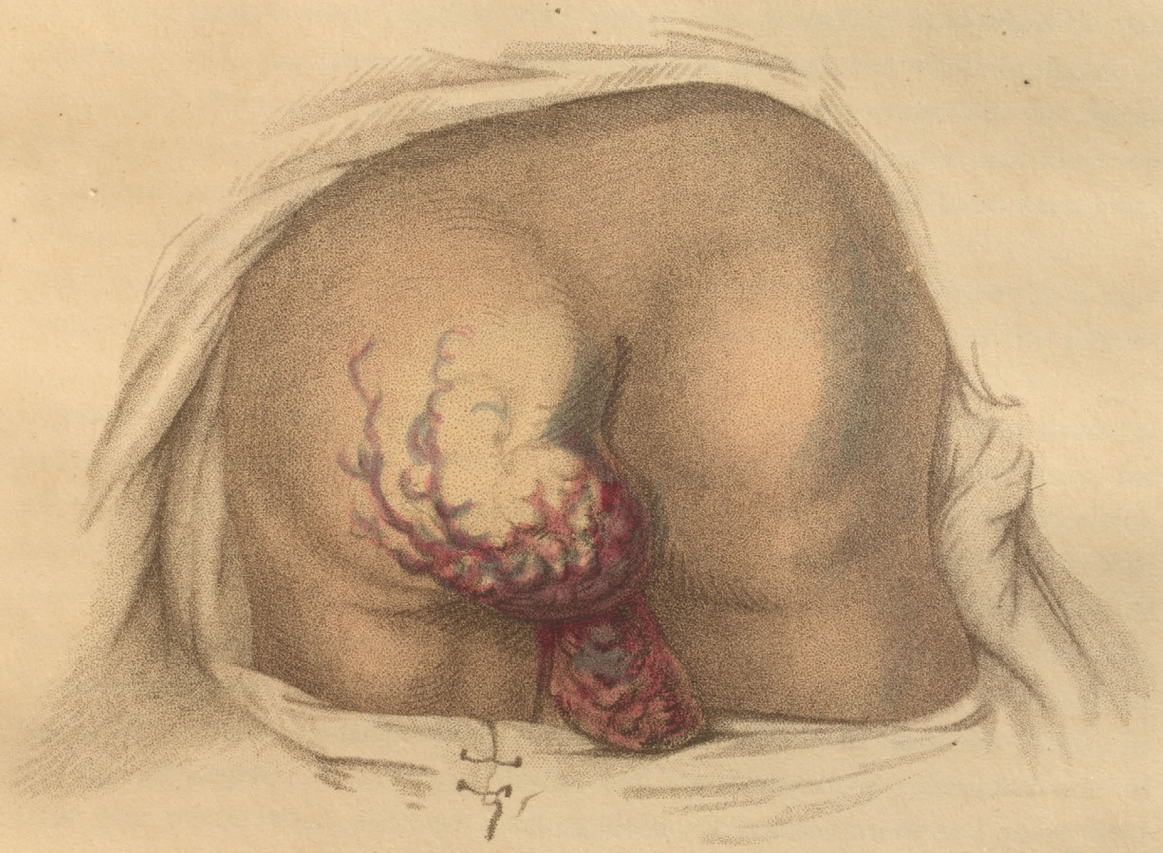
John Doring, a native of Ireland, a ſoldier of the Perthſhire Fencibles, was put on board a tranſport, and in walking careleſsly, fell down the hatches into the hold. He lighted with his breech on the gudgeon of a ſwivel; and the ſhock was ſo great, that he lay inſenſible for half an hour. He had lighted exactly upon the tuberoſity of the left iſchium; the parts ſwelled, the ſwelling extended to the teſticle, and for a long time he was in great diſtreſs. When he firſt obſerved a particular tumor, it was circumſcribed, ſeated exactly upon the knob of the left iſchium, pulſating, painful, and very diſtreſſing when he walked; but at firſt there was no ſwelling of the veins. The tumor, after ſome months of growth, was of a very extraordinary appearance. The ſkin of the buttock was thickened into a tumor, which, when handled, felt like dough; and the ſkin of the ſcrotum, thickened by the ſame proceſs, mixed inſenſibly with

"Quorum reciprocum ſonitum, equidem memini, cum Henrico Salio Medico Ultrajectino, ſatis diſtincte audiviſſe, licet id temporis ab ipſo receſſiſſemus, ultra triginta pedes." TULPIUS, p. 139.

That an enlarged and pulſating ſpleen is not inconſiſtent with the economy of the circulating ſyſtem, has been juſt explained. If it ſhould be thought rather ſurpriſing that every enlargement of this viſcus does not pulſate, and that ague cakes do not appear in this form of pulſating ſpleens, let it be remembered how much the ſpleen is indurated in thoſe caſes, and its pulſation repreſſed by the additional quantity of matter, and by the ſchirrous hardneſs which takes place. I have no doubt that the theory I have ſuggeſted, will be found fully as ſatisfactory in explaining the fact of a pulſating ſpleen, as that of Tulpius, who attributes the return of this man's ailments to fits of the atra-bilis, under which he laboured. "And the atra-bilis (ſays Tulpius), and the vital ſpirits, and the arterial blood, being obſtructed! ſtrive with one another! ſo as to move eaſily even the heavy and enlarged ſpleen, and make it beat againſt the ribs; all which we can very well underſtand, by the analogy of other confined ſpirits! what they can do, when oppoſed, may be eaſily imagined, from the examples of thunder! and cannons! and cheſnuts roaſting in the fire!"

If I reckoned it a matter of great importance to eſtabliſh the fact of a pulſating ſpleen, I ſhould neither give this tranſlation nor the original of this curious piece of philoſophy, which is not very honourable to Tulpius, or rather to the age he lived in. "Excitati itaque fuere hi ictus, cum a motu atræ bilis: tum a ſpiritu, ſanguini arterioſo, incluſo. Quæ duo acquiſivere tantum virium; ob prohibitam tranſpirationem; et adſtrictam, arteriarum ſpleneticarum, obſtructionem: ut potuerint non modo elevare, ſed movere ſatis commode grave, ac induratum lienis corpus."

"Virtus quippe unita multum poteſt. Exemplo ſint, tonitru, tormenta bellica, *caſtaneæ carbonibus impoſitæ*. In quibus luce clarius apparet, quid valeat ſpiritus incluſus."



ANEURISM of the HIP & SCROTUM
in
JOHN DORING.

J. Bell del.

J. Grant Sculp.

the tumor. The veins of the hip, which we never ſee in their natural condition, were very ſingularly dilated; and the enlarged ſtate of the veins extended very high upon the buttock. The veins of the ſcrotum were alſo very ſingularly dilated, but there was no affection of the teſticle itſelf. The parts were not in any degree painful when handled; the tumor was diſtreſſing only when he was obliged to walk, but there was a general pulſation through the whole ſubſtance of the tumor. He was a very rude fellow, had gone into the army with no intention of ſerving. There was, indeed, no motive in ſuch a caſe for propoſing any operation; but I was ſenſible that though there had, it would have been vain, he had other objects in view! he would not be cured!

Among the caſes in which a neglected tumor of this kind has grown to a very remarkable ſize, I hardly remember any one more particular than the following.

Janet Tarbet, about twenty-five years of age, a poor woman, who lived far in the north country, had a tumor of this kind growing for twelve years, for which ſhe had ſuffered one partial operation, which was of courſe unſucceſsful. She was ſenſible of no cauſe to which this tumor might be aſcribed; ſhe was, indeed, in the loweſt condition of life, and employed in the coarſeſt country work, but certainly received no blow. About twelve years before I ſaw her, ſhe firſt perceived, upon the outſide of the knee, not a tumor, but a ſpot or mark, flat, and of a purple colour, ſmooth as the reſt of the ſkin, not painful in the ſlighteſt degree; it grew very ſlowly, and for a long time reſembled one of thoſe blue marks which are born with children; it became more and more livid as it increaſed in ſize; and though void of pain in general, it was painful when ſtruck by accident, as againſt the corner of a chair, and the pulſating pain continued for a quarter of an hour. She was a reaper in two harveſts, after this formidable tumor began; it was only after the labours of the ſecond harveſt, that ſhe was ſenſible of the increaſe of the tumor. During the firſt harveſt it increaſed ſlowly, but the labours of the ſecond harveſt excited the tumor ſo much, that it grew in a ſhort time to the ſize of an egg.

Her condition before the firſt operation was performed (which was in the third year of the diſeaſe), was very ſingular. She had been all her life a poor, laborious creature, alternately ſpinning night and day, or working at the heavieſt country work. When at any time ſhe chanced, in working, to ſtrike her knee againſt any thing, the tumor was excited, and began to riſe and to beat very

ſtrongly; even the motion of the leg in ſpinning made it ſwell. When ſhe went to any violent labour, the tumor puffed up; it beat very ſtrongly, and felt, ſhe ſays, "as if it was a heart, or as, ſome living thing had been in it:" at ſuch times ſhe was obliged to lay herſelf down upon the bed; and after a quarter of an hour of quiet, the beating ceaſed, and the pain went off, for there was much pain when this beating began.

She was often a week without pain; at other times the pain and beating returned daily, or frequently during the day, according to the work ſhe had to do; but the tumor was always ſingularly affected by the return of her courſes. During the firſt fortnight after the menſtrual evacuation, the tumor continued very low and flaccid; the ſecond fortnight it became full, and even turgid; then it began to pulſate, and in the week preceding menſtruation there was a turgeſcence and ſtrong pulſation, which ceaſed the day the courſes diſappeared. During a long period her menſtruation was profuſe, and there were alſo terrible hæmorrhages from the tumor. Theſe hæmorrhages were more frequent at the approach of menſtruation; they happened from the ſlighteſt accident, which broke the ſurface of the tumor; ſhe was uſed to command the torrent of blood, by bandaging the tumor very firmly, or, as ſhe expreſſed it, by "hanking the part very hard with cloths or handkerchiefs." After each hæmorrhagy, whether from menſtruation or from a blow, the tumor, which was livid and ſoft, healed up with a ſort of ſcab; and after every loſs of blood, whether by menſtruation or by direct hæmorrhage, ſhe was reduced to a very low ebb; and the tumor itſelf, which had been very blue, tenſe, and pulſating ſtrongly, became pale and flaccid, and hung quite pendulous, as if it were a mere bag juſt emptied of its blood.

This is the whole deſcription of the diſeaſe, which became in the third year of its growth the ſubject of an operation. It was flat and livid at firſt; it ſoon began to bulge out, to throb, and to bleed; it had grown by ſucceſſive impulſes to the ſize of an egg; it was only after the labours of the ſecond harveſt, that it began to be very prominent in the time of its turgeſcence, or to be flaccid and bag-like when it was emptied of blood.

The pain, want of ſleep, and inability to work, the frequent hæmorrhages, and the deſtruction of her health, and the effect which the pulſation of the tumor, when heated in bed, in haraſſing her mind, inclined her to call the ſurgeon, who ventured to ſtrike a lancet into the tumor as a teſt of its nature; the blood in-

ſtantly ſpouted out, as if he had opened a vein; it was cloſed with a compreſs of lint and a bandage. The next day the operation was performed; the tumor was extirpated, and a number of ſmall arteries were tied.

After the operation ſhe fell very low, became ſick, feveriſh, and at laſt delirious; and when ſhe recovered her ſenſes, the tumor was manifeſtly increaſing again, ſo that at the end of ſix weeks it was propoſed to operate a ſecond time, in order to cut out ſome ſmall remains of the tumor; but ſhe was now reſtored to her ſenſes, found herſelf eaſy, ſaw no danger in the tumor, and abſolutely refuſed to ſubmit to another inciſion. For ſeven years ſhe had continued wonderfully well, ſome remains only of the tumor appeared; the lower part of it hung down pendulous, by her account, like the auricle of the heart, and was more or leſs turgid, according to the ſtate of her health, or of her menſtruation, the ſeaſon of the year, or the labours ſhe engaged in; but ſhe was hale and ſtrong, and ſaid ſhe could match herſelf with any young perſon at work, and at all kinds of work.

In the ninth year of this diſeaſe the little pendulous flap began to grow again; it began to be affected by labour and menſtruation, and upon the ſlighteſt accident it bled as at firſt; the pulſation became more perceptible at each menſtruation, and at each menſtruation the tumor received an increaſe of ſize. By the tenth year it was enlarged to the ſize of a twopenny loaf, and beat very violently; but it was only in the beginning of the eleventh year that it burſt out again. This happened to her one evening when ſhe was abroad at work. In a moment her ſtocking and ſhoe were filled with blood. Since the time of the operation (for eight years) ſhe had worn a bandage, which ſhe found neceſſary, both to repreſs the pulſation, and to moderate the pain; without it, indeed, ſhe could not walk even the length of the door. This bandage did not reſiſt the hæmorrhagy! ſhe undid the bandage, crawled home, and applying cloths, and hanking it very hard, ſhe at laſt ſuppreſſed the hæmorrhagy.

From this time the bleedings became frequent and irreſiſtible. Often while ſhe was, as ſhe expreſſes it, "hanking it with the bandages," the blood worked up among her fingers; and when ſhe claſped it firmly with her hands, ſhe felt the ſtrong throbbing which cauſed it to bleed. She was always alarmed before the bleeding, with the tenſion, heat, and throbbing of the tumor. It burſt out regularly every ſix weeks. For a year paſt it has diſplaced the

menſes, has ruined her health, and reduced her, I perceive, to extreme weakneſs.

Such is the faithful hiſtory of the diſeaſe, for which this woman is now to ſuffer a ſecond operation. But there remains one circumſtance to be told, of the moſt extraordinary nature. The tumor, which a few days ago was full, and of the ſize of a man's head, now hangs pendulous, in the form of a thick and fleſhy bag, very thick and ſolid, but perfectly pendulous, livid on its ſurface, flaccid, and without pulſation, and with large ſcabs on the places from which the blood was uſed to flow. As ſhe was travelling up to town, the tumor burſt, and three chopins of a clear fluid were diſcharged in an inſtant from this tumor! which never before diſcharged any thing but blood.

The tumor was extirpated by a ſurgeon in this city, very dexterouſly, with two long ſtrokes of the knife, which went quite round the root of the tumor; and dreadful as the hæmorrhagies had been, and although the inciſions by which it was cut off were fully ſix inches long, not one drop of blood flowed; and after the tourniquet was entirely ſlackened, nothing that we could contrive could excite even the ſlighteſt hæmorrhagy. The inciſion was made pretty wide from the root of the tumor; one ſmall artery only was tied; the patient did not loſe even ſix ounces of blood.

We muſt take a particular intereſt in this diſeaſe; for ſuch a tumor, ſo large, ſo livid, ſo foul and ſcabby, bleeding furiouſly, and returning after an imperfect operation! is but too apt to be called a cancer, and the patient to be condemned to a lingering death, embittered by continual alarms. Concerning the nature of this woman's diſeaſe, I believe you will have no difficulties; but this laſt accident, the diſcharge of a pure coagulable ſerum, and in ſuch prodigious quantity, requires explanation.

Let me obſerve, that tumors of various kinds, and eſpecially cancerous tumors, often produce an enlargement of all the adjacent veins; and were I now delivering a hiſtory of tumors (and I wiſh I were), I ſhould deſcribe to you a variety of cauſes from which ſuch varicoſe dilatations and profuſe hæmorrhagies ariſe. But I am delivering only a hiſtory of aneuriſms, and have but to prove to you that this is no ſuch hæmorrhagy.

Had this woman's diſeaſe begun with a ſerous tumor, ſurrounded by ſuch dilated veins, the tumor, before it could have produced ſuch enlarged veins, muſt

have been itſelf very large ; and while the tranſparent part of ſuch tumor had been conſpicuous, the veins muſt have been very ſmall, the colour natural, the bleeding ſlight, and eaſily repreſſed ; and the turgeſcence of the tumor would have been accompanied with no ſenſe of heat, with no ſenſe of pulſation, much leſs with any actual pulſe. On the contrary, this diſeaſe began not as a tumor, but as a flat livid ſpot ; it roſe very ſlowly from the ſurface ; was ſoft, red, and of courſe vaſcular ; it was diſtinguiſhed even at the beginning from any bag of ſerum ; its firſt bleedings were very violent and were preceded by diſtinct pulſation. How could the ſurgeon have punctured the tumor without ſeeing this ſerum? He ſtruck his lancet into it, and nothing but pure blood flowed ; he extirpated the tumor, and ſtill ſaw nothing but a bag of blood.

Had one of the burſæ mucoſæ of the knee joint been thus enlarged ; had the common cellular ſubſtance been formed into a ſerous tumor (which is a rare accident) ; had ſuch ſerous tumor been the original diſeaſe ; had this ſerous tumor enlarged by its growth the concomitant veins ; and finally, had ſuch complicated tumor burſt again and again every ſix weeks ; the ſerous part of the tumor muſt have been perceived ; the ſerous part of the diſcharge muſt have been recognized and diſtinguiſhed from the blood? But of the hundreds of times at which it bled no ſerum appeared ; and behold, at its laſt burſting, it poured out all at once three pounds of ſerum, without one drop of blood. How can this be explained! How could ſo great an aneuriſm pour out ſerum inſtead of blood?

Let it be remembered, that when the ſurgeon firſt extirpated this tumor, after it had arrived at the ſize of a turkey's egg, he found in the centre of it a ſmall cavity, no larger than was ſufficient to contain a walnut ; and it was filled with a firm coagulum of blood. Let it next be obſerved, that in a tumor growing to this great ſize, much of its bulk will, in the progreſs of the diſeaſe, conſiſt of various ſacs. There muſt be in ſuch a tumor large cellular cavities, as well as dilated veins.

Let it be remembered too, that the hæmorrhagy had, about five weeks before the operation, been exceedingly profuſe ; that the whole tumor was flaccid when ſhe ſet out upon her journey ; that the riding in an uncovered cart gave her terrible pain, and that the baſis of the tumor was highly inflamed ; it may then eaſily be imagined how thoſe ſmall arteries, which were wont to diſcharge blood, had ſecreted a ſort of ſerum, juſt as the menſtrual diſcharge, which conſiſts of blood alone, commences and cloſes with a very profuſe ſerous diſcharge. Let it be conſider-

ed, on the other hand, how the veſſels of the ſtomach, of the bowels, of the kidneys, of the throat, of the noſtrils, and even of the common ſurface of the body, are ſo dilated, as to diſcharge, inſtead of the common exſudation or tranſpiration, pure and entire blood; which blood is poured out by anaſtomoſis (as the ancients called it), i. e. by the open extremities of the veſſels, and not from any breach of ſurface.

This tumor being diſſected, is found to contain one large cavity, and ſome very ſmall ſacs, of the ſize of peas or gooſeberries, as if they were incipient ſacs like the great one. That theſe veſicles were generated by the veſſels which form this tumor, is certain, from their being buried in the moſt ſolid parts of the tumor. Yet none of the tumor can be ſaid to be ſolid; it is all of a ſingularly ſpongy texture; the extreme veſſels ramify through it in a moſt ſingular manner, ſo as to form a cellular ſubſtance; and from theſe extreme veſſels, as it appears to me, the blood had been poured out, like a ſort of menſtrual diſcharge.

Yet even my own ſenſes could hardly have convinced me that this was a mere aneuriſm of the kind which I have deſcribed! Although I had ſeen this kind of aneuriſm in various gradations, ſo as to be aſſured (from the caſe, for example, of Jean Smith) that it might grow to an unlimited ſize, yet I had myſelf a degree of doubt; I waited anxiouſly for the report of the country ſurgeon; and that I might have an unprejudiced report from him of the nature of this tumor, I was careful to conceal my own opinion of the caſe. I mentioned the woman's diſeaſe as one which we apprehended might be a cancer, and begged to have the hiſtory of the firſt operation; and Mr. Adams, the ſurgeon, in his letter to me, deſcribes the diſeaſe in thoſe very terms which I have choſen as characteriſtic of this kind of aneuriſm. His letter is as follows: "Sir, Being from home on Sunday, I received your letter only laſt night, very late; and I fear, now that I do anſwer it, my information will be but little ſatisfactory to you or the gentlemen who have intereſted themſelves about this woman. Whatever I remember concerning her I will mention with pleaſure; but to anſwer all your queſtions, is, I fear, impoſſible, conſidering the lapſe of time ſince the operation was performed, and that I took no notes of the caſe.

"It was about nine years ago that this woman firſt applied to me, when the tumor on the knee was about the ſize of a turkey's egg. That part which projected above the ſurface of the thigh was hemiſpherical, with one or two ſmall

protuberances on the top, and one of theſe had a ſcab upon it, from which point it bled freely, when diſturbed by any accidental cauſe. By theſe occaſional hæmorrhages ſhe was much reduced; but for the quantities of blood ſhe loſt, or the time this diſeaſe had continued, I muſt refer you to her own report. The whole tumor was of a natural colour towards the baſe; the protuberance was livid, and the moſt prominent parts were of a high red colour."

"In the courſe of a week or two after I ſaw her, the operation was performed in preſence of Dr. Key. During the inciſions *a number of ſmall arteries ſtarted*, but two only required to be tied. She loſt little more than four or five ounces of blood."

"The tumor adhered very firmly to the fleſh of the thigh. The whole was ſuppoſed to be extirpated, yet ſuch was the adheſion of this tumor to the muſcles, that it is not impoſſible ſome ſmall portion might have eluded the knife."

"On examining the tumor after extirpation, there *was a diſtinct ſac in the centre*, which might contain a ſmall walnut, it was filled with a hard ſubſtance reſembling clotted blood. The *ſides of the tumor had a glandular appearance, replete with ſmall blood veſſels*, thick towards the baſe, and gradually thin towards the top *."

"For a few dreſſings, eſcharotics were applied, the wound ſoon aſſumed a healing appearance, and in the courſe of a few weeks healed up. Neither Dr. Key nor myſelf ſuppoſed it cancerous at that time. The girl could give no diſtinct account of its duration; but we thought, from its appearance, that it muſt have been years a-growing."

* I cannot help remarking here how very correctly the deſcriptions of ſurgeons, who had no knowledge of this theory, correſpond with the account which I have given above of the nature of this tumor. Mr. Hill, ſurgeon in Dumfries, having extirpated a tumor of this kind from the eyelid of a child, but with too ſmall an inciſion, had actually left a conſiderable part of it behind, and was employed in cutting off the remaining diſeaſed veſſels with a ſeton. After the dreſſings had fallen off, he ſays, "I had then an opportunity of viewing circumſtances more deliberately, and was ſorry to ſee, that though the inciſion was begun within a ſtrawbreadth of the eyelaſh, yet part of the tumor, which was within the ſocket, was left behind. In this *the large red arteries and blue veins made a very ſingular appearance, reſembling net-work in a kind of whitiſh tranſparent jelly*. As I durſt not attempt any more cutting, two threads of cotton were drawn in by a crooked needle below the bottom of that part of the tumor which remained, and were left as a ſeton-cord to conſume it gradually. Red precipitate and burnt alum were tried ſeparately with the ſame view; but they gave ſo much pain that the infant could bear neither of them. The cord, however, in a few weeks cut its way through, and deſtroyed the remainder of the tumor ſo fully, that ſlight dreſſings ſoon completed the cure."

" From the time of this operation I knew nothing of her condition till lately, when I was much aſtoniſhed with the magnitude and other circumſtances of the tumor. She was very poor, and had not a friend on earth to care for her; it was for this reaſon I adviſed her to go to the Edinburgh Infirmary to have this ſecond operation performed. I remain, &c.

JOHN ADAM."

Let me now mention to you the chief circumſtances of a very remarkable caſe related by Deſſault; you will perceive in it many analogies, which will explain in ſome degree the difficulties of this caſe; you will perceive, that a pulſating aneuriſm of this kind may, by being irritated and inflamed, be brought into ſuch a condition as to pour out ſerum only inſtead of blood.

" * Anne Vachot was born with a ſmall excreſcence under the chin, of the ſize of a ſmall ſtrawberry, but without heat, pain, or any change of colour in the ſkin. As it did not increaſe in proportion to the growth of the child, it attracted little attention, from infancy till the fifteenth year of her age there was little change; but from the period in which the menſes appeared, it increaſed all at once; it was remarkably elongated, to double its ſize, and there diſtilled from the point of it a very florid blood; the hæmorrhagy became periodical, and ſo exceſſive as to produce an alarming degree of weakneſs; while a periodical headache and a ſlight giddineſs preceded each return. But there was not, about this period, any change on the tumor, except a very ſenſible heat, and a ſlight enlargement of ſome ſmall cutaneous veins."

" The influence of this hæmorrhagy upon her ſyſtem was diſtinctly marked,

* Anne Vachot, de Saint Maury en Breſſe, vint au monde, portant au menton une tumeur de la groſſeur et de la forme d'une petite fraiſe, ſans chaleur, ſans douleur et ſans changement de couleur à la peau.

Comme cette tumeur ne gênoit en rien les fonctions, on y fit diautant moins d'attention, qu'elle ne paroiſſoit pas ſuivre les progrés da l'accroiſſement. Elle changea peu, en effect, pendant les cours des premiers 15 années; mais à l'épuoque des regles, ſon volume doubla tout-à-coup; elle prit une forme plus allongée, et l'on vit ſuinter par ſon extrêmité un ſang pur et vermeil, dont le flux qui s'érablit avec une ſorte de périodicité, fut par fois aſſez abondant, pour amener une foibleſſe allarmante. Chacun de ſes retours étoit précédé de maux de tête conſidérations et d'étour diſſemens paſſagers. Avant et après l'apparition de ces ſimptômes, la tumeur n'éprouvoit aucun changement dans ſon volume: ſeulement une chaleur plus vive s'y faiſoit ſentir, et quelques petites veines cutanées devenoient plus apparentes.

Les regles parurent enfin, mais en petite quantité, toujours avec irrégularité, et ſans infleur ſur l'abon-

the menſes became irregular and ſparing, and the breaſts hardly unfolded themſelves when ſhe had conſiderably paſſed the uſual age."

" She was twenty-four years of age, when ſhe was received into the Hotel Dieu of Lyons. This was no longer a ſlight deformity, but a ſerious diſeaſe; in the courſe of the three laſt years the tumor had acquired three times its original ſize; it reſembled a middle ſized pear, adhering by its baſis to the chin; the heat was continual, and the expanſive pulſation was felt at every point of the tumor, but eſpecially at the apex, (the only point where the ſkin was become red, tender, and ſhining); there the pulſation was particularly felt, while the pulſation was deep and heavy towards the baſis of the tumor."

" None of the arteries, ſubclavian, carotid, nor maxillary, had ſuffered the ſlighteſt change; there was no fluctuation in the tumor, nor could you make the ſlighteſt impreſſion upon it by preſſing with your hand; but you could diſtinguiſh with the finger ſome inequalities and hardneſſes under the ſkin, like ſmall lymphatic glands."

" However difficult it might be to ſuppoſe an aneuriſm in a place where the arteries were ſo ſmall, yet the ſtrong pulſation of this tumor, and its frequent hæmorrhages, gave reaſon to ſuſpect, if not an actual extravaſation of blood, at

dance de l'écoulement par la tumeur, ni ſur la fréquence de ſes retours. Les ſeins ſe développerent auſſi très-tard, et ne parurent pas recevoir, de l'approche de la puberté, l'influence accoutumée.

Cette jeune perſonne, robuſte et bien portante, avoit atteint ſa 24$^{e}$ anée, lorſqu'elle entra à l'Hôtel-Dieu de Lyon, le 4 Mars 1791. Elle n'avoit plus alors une ſimple difformité; c'étoit une maladie réelle, qui l'obligeoit de réclamer les ſeccours de l'art. Dans le cours de trois années, la tumeur avoit acquis un volume triple: elle reſſembloit parfaitement à une poire de moyenne groſſeur, et adhéroit au menton par ſa baſe. Son indolence étoit la même qu'auparavant; mais la ſenſation de chaleur, qu'elle faiſoit éprouver, étoit devenue continuelle et plus forte. Un battement véritablement expanſif ſe faiſoit ſentir dans toute ſon étendue, ſur-tout à ſa pointe, ſeul endroit où la peau rouge, luiſante, amincie, parût avoir ſouffert quelque altération. Cette pulſation perdoit de ſa force et ſembloit devenir plus profonde, à meſure que l'on approchoit de la baſe de la tumeur, où enfin elle diſparoiſſoit entiérement.

Les arteres ſouſclavieres, carotides, maxillaires externes et temporales n'avoient ſubi aucun changement, ni dans leur calibre, ni dans le mode de leur pulſations. Aucune fluctuation ne ſe faiſoit ſentir dans la tumeur; la preſſion ne lui faiſoit rien perdre de ſon volume; enfin le tact découvroit ſous la peau quelques inégalités qu'on auroit pu prendre pour de petites glandes limphatiques engorgées.

Quoiqu'il fut difficile de ſe prêter à l'idée de la formation d'un anéuriſme, dans un endroit où les vaiſſeaux ſont ſi petits, cependant le battement dont cette tumeur étoit accompagnée, et le ſang qu'elle avoit endu, à tant d'époques différentes, devoient faire ſoupçonner, ſinon un ſang épanché dans ſon intérieur, au moins une dilatation conſidérable des vaiſſeaux qui la nourriſſoient. On crut donc devoir, pour l'extirpa-

leaſt a remarkable dilatation of the veſſels which ſupplied the tumor. It was manifeſtly more prudent to uſe the ligature for the extirpation of this tumor than the knife."

" The ligature was applied the tenth day after her arrival in the hoſpital; the ſtricture was but ſlight, the tumor became painful, inflated, and very red; the ſcarf-ſkin ſeparated from it, and there was a remarkable effuſion of a ſerous fluid; the pulſations at firſt increaſed in violence, and continued ſuch as to give the patient great diſtreſs, while the ſerous effuſion continued equally profuſe till the fourth day."

" On the fifth day there happened, in conſequence of a ſmall crack in the upper part of the tumor, a conſiderable hæmorrhagy. The blood ſtopped indeed, but the patient was weakened; obſcure pulſations were ſtill felt in the tumor; the ſerous diſcharge continued; the phlictenæ and points which diſcharged the ſeroſity, began to whiten and ſuppurate; the ligature was tightened from time to time, and when the tumor ſeemed quite deadened, and hanging by a pedicule, it was cut off with a knife, diſcharging only a few drops of blood."

tion de cette tumeur, préférer la ligature à l'inſtrument tranchant; quoique la machoire inférieure eût pu fournir un point d'appui ſuffiſant pour la compreſſion, dans le cas d'hemorrahagie, et que la ligature ne fût pas propre à raſſurer contre l'accident que l'on redoutoit, et qu'elle eût au contraire, de plus que la compreſſion, l'inconvénient de rendre plus difficile l'application des moyen par leſquels on auroit pu dans le beſoin, ſe rendre maître du ſang.

Quoiqu'il en ſoit, la ligature fut partiquée, dix jours après l'arrivée de la malade à l'hôpital; et comme elle fut peu ſerrée, la tumeur s'enfla, devint douloureuſe et trèſrouge; l'épiderme ſe ſouleva en phlyctaines et donna iſſue à une quantité conſidérable de ſéroſité. Les battemens, qui avoient d'abord paru diminuer, ſe firent bientôt ſentir avec plus de force, et ſe ſoutinrent de maniere qu'ils devenoient fatiguans pour la malade. L'écoulement ſéreux continua, les jours ſuivans, avec la mème abondance, et ne ſe rallentit que le 4^e^.

La nuit du 4 au 5^e^ jour après la ligature, il ſe fit une hémorrhagie conſidérable, par une petite crevaſſe de la partie droite et ſupérieure de la tumeur, dont les battemens parurent alors affoiblis, ſans qu'elle eût rien perdu de ſon volume. Le ſang s'arrêta de lui-même; mais il fallut veiller ſur les forces de la malade, et les ſoutenir par des cordiaux.

La journée du 6 fut tranquille: la tumeur parut alors offrir plus de rénitence; les points de ſa ſurface, où il s'étoit formé des phlyctaines, blanchirent et commencerent à ſuppurer; il ſortit encore un peu de ſeroſité.

Le 7, l'on ſentoit encore des battemens obſcurs. La malade ſe trouvoit mieux; ſes forces s'étoient relevées; la ligature, qu'on avoit reſſérée à pluſieurs repriſes, avoit déja diviſé la tumeur profondément; enfin, le 11^e^ jour, comme la ligature ne paroiſſoit plus tenir que par un pédicule étroit, et que les hémorrhagies ne s'étoint pas renouvellées, on acheva de la ſéparer avec le biſtouri. Il ſortit à peine quelques gouttes

Theſe gentlemen found it difficult to conceive this to be an aneuriſm, becauſe the only aneuriſm they could imagine was the dilatation of ſome ſingle arterial tube; what is commonly called a True Aneuriſm! But the ſingular ſize of this tumor, and the extreme ſmallneſs of the maxillary arteries, the vaſt diſproportion betwixt ſuch an aneuriſm, and any individual artery, forbad ſuch a concluſion.

It is to be obſerved, that this being an aneuriſm from anaſtomoſis, its arteries were ſmall but wonderfully active; they were excited in paroxyſms, they took upon themſelves the function of menſtruation; and puberty had hardly appeared, and menſtruation begun, before theſe veſſels increaſed to a great ſize, or poured out ſo much blood as to ſuperſede the menſtrual flux.

It is next to be remarked, that while this ſet of active arteries were thus periodically excited, they were alſo capable of being excited by any occaſional irritation; and thus their high action, quick pulſations, and occaſional hæmorrhages marked the nature of the diſeaſe. When the ligature was put round this tumor, which it could not entirely compreſs, one part defending another, thoſe central parts which were not compreſſed were irritated; a deep, inceſſant, and painful throbbing came on, and laſted for five days; and during that time, the ſerous diſcharge took the place of that effuſion of pure blood, which was wont to flow in the uninflamed ſtate of the tumor. A new ſecretion took place like that which, even in its moſt natural ſtate, uſhers in and cloſes each menſtruation.

All the other analogies of the caſe, I will leave to your own ingenuity; you eaſily foreſee how, in ſuch aneuriſms, various ſacs will be formed, and how they may be repleniſhed with other ſecretions beſides blood. One part only of Deſſault's report, I muſt not neglect to ſtate to you. "The tumor being opened, preſented a white cellular texture, firm, lardy (comme couenneux), interſperſed with numerous blood veſſels, which ſeemed to be profuſely ſcattered under the ſkin."

Of ſuch tumors ariſing ſpontaneouſly in adult years, I find hardly any recorded. There is, indeed, one caſe related by Mekren, which I ſhall mention as a warning to the young ſurgeon not to meddle raſhly with any tumor till he

de ſang. La plaie fut panſée à plat, et n'offrit rien de particulier juſqu'à la formation de la cicatrice, qui fut parfaite, le 19 Avril, 26 jours après la ſéparation complette de la tumeur, et le 36e de la ligature.

La tumeur overte ne préſenta qu'un tiſſu cellulaire blanchâtre, dur, comme couennex, dans lequel rampoit un aſſez grand nombre de vaiſſeaux ſanguins, qui paroiſſoient répandus ſous la peau, avec plus de profuſſion que dans l'état ordinaire et naturel. MARC. ANTOINE PETIT.

have thoroughly reflected on its nature; nor even to puncture tumors, however trivial, which have any degree of pulsation, or which contain blood.

" Maria de Waart, younger daughter to a senator of Amsterdam, was relieved from chronic pains of the head, ears, and teeth, by the forming of a whitish tumor on the palate, of the size of a walnut. Both physicians and surgeons believed it to be a small abscess; at our instance (says Mekren) the patient submitted to the operation; the tumor was opened with the lancet, when, instead of pus, pure and florid blood flowed in great profusion, which we were obliged to repress with permanent compression of the finger."

" In five or six days more, we opened the tumor again, which was now greatly enlarged, and unquestionably contained pus, so at least we believed! but no sooner was the incision made, than the hot blood issued with such impetuosity, that we were obliged to suppress the hæmorrhagy by thrusting lint into the wound."

" Seeing these attempts had been thus unsuccessful, it was thought by no means prudent to open such tumor again, but to endeavour, by time and applications, to convert the blood into pus. To this effect, we ordered a decoction of marshmallows, althea, lintseed, figs, &c. sweetened with syrup of althea, to be held warm in the mouth. By such gargarisms, we daily observe tumors of this kind discussed, but this one was not cicatrized without a previous exfoliation of the palate *."

The nature of this tumor is very manifest; let it be a warning to the young surgeon, who sometimes finds himself thus unawares engaged with an enemy he does not expect. This must have been a small aneurism by anastomosis, which had been so long neglected, as to have spoiled the bone. Mekren congratulates himself on having recollected that hole, described by Schultetus, through which arteries and veins pass down to the palate from the nose †.

Whether some history of such a tumor arising spontaneously, and in an adult person, may not lurk in some odd corner of an old book, I do not know. I have a suspicion that it is the disease mentioned by Mr. Pierson of the Lock Hospital ‡.

* Mekren, page 267.

† Curatione sic insperata absoluta nostrum credidimus esse, unde collectio sanguinea dicto loco se exhibens provenerit cognoscere: Nullus hic occurrit qui vel verbis vel scriptis vias commodus indicare potuit. Aliquid lucis huic difficultati adferunt quæ ob. 24 Armament. Chirurg. proponit Joan. Scultetus medicus et chirurgus ulmensis ductum hic describit circa dentes molares a pallato ad nares extensum, in quo vena atque arteria commodæ tunnicæ inclusæ detinentur, &c.—MEKREN.

‡ *Vide* Medical Communications of London, Volume II.

Mr. Pierſon ingenuouſly confeſſes himſelf at a loſs to aſcertain the nature of the diſeaſe, for me to pretend to explain it, were nothing leſs than preſumption. But the caſe related by the late Mr. Elſe, of John Callahan, a mariner, who fell upon an anchor ſtock, had ſurely been an aneuriſm of this nature *.

Except theſe two caſes, which I rather ſuſpect than believe to have been aneuriſms from anaſtomoſis, all the caſes related by authors, have been either of purple and bleeding ſpots, which were perceived at the time of birth; or have been caſes ſo irregular and dangerous, and ſo little underſtood, that they have been thrown into the common chaos of indeſcribable and incurable diſeaſes; they have been called ANOMALOUS CASES, or BLOODY TUMORS. But every bloody tumor muſt have a cauſe? muſt proceed from a wound? a bruiſe? an enlargement of one or more veſſels? it is ſurely then our duty to inquire carefully into every ſuch diſeaſe.

Of thoſe purple and bleeding ſpots or deformities, and of the ſpontaneous aneuriſm from anaſtomoſis, the nature and internal ſtructure, is unqueſtionably the ſame; but the nature of the one is obvious at firſt ſight, the hiſtory of the other requires a ſerious and diligent inveſtigation. Thoſe purple ſpots, eſpecially if ſoft, hollow, and not upon the ſurface, but within the ſubſtance of the ſkin, are never without danger; they ſhould be cut out early, both as they are growing deformities, and as tumors which may eventually come to ſuch a ſize, as to injure the health by repeated hæmorrhages, or even to prove fatal by burſting out during the night. Frequently we have no choice, they are ſometimes ſeated upon the lips, and protrude (as in the caſe related by Severinus) ſo much, as to prevent the child ſucking. The more protuberant of thoſe tumors, may be cut off by a ligature; thoſe which are flatter, though protuberant, have yet a broader baſe, and may be killed by ſtriking a needle through the baſe of the tumor, and tying the threads of the ligature on either ſide. The ſureſt way is the knife, for in uſing the knife, you know when you have extirpated the tumor, and you bring the lips of your inciſion to approach ſo as to leave little mark.

But the aneuriſm which I have been deſcribing, though it differs from theſe connate aneuriſms in no eſſential point, ariſes, you perceive, either ſpontaneouſly or from a blow. The diſeaſe may form in any part of the body. I ſhould have named it cutaneous aneuriſm, but that it occupies all parts of the body, the viſcera as well as the ſkin. Its colour, pulſation, and frequent bleedings, are ſure marks of the

† *Vide* Medical Obſervations and Inquiries, Volume III. page 170.

diſeaſe; and whether large or ſmall, the tumor is ſtill of the ſame nature *. It is a congeries of active veſſels, communicating ſometimes with cellular ſubſtance only †, ſometimes with larger cells ‡, and ſometimes forming remarkable ſacs in the centre of the tumor. This aneuriſm is a mere congeries of

* Sed et lacteolæ infantis, vix ſemeſtre ſpatium emenſæ, Andreæ cujuſdam holoſerici mercatoris filiolæ, *atro cruentum tuberculum* labio inferiori agglutinatum nedum obſervare mihi contigit, ſed et curare, molliuſculum, non æquabile, interne etiam prominulum, teſtudinis terreſtris ova majus; cujus objectu laborioſe, cumque ejulatu, ſimul et exſuctu minus felici, remixtis, infantula victum attingebat. Ac ne attingebat quidem, ne proinde adjutans nutrix prompta manu, compreſſis aſſidue mammis, quæſitam nectaris guttulam aridum in os infunderet: ad quam calamitatem diurnam, nocturnamque, levandam accitus ego, miſeris in rebus adhiberi ſolitus ſum, non tam pœoniam quam chironiam opem neceſſariam denuncio; cui decreto remiſſus à parentibus nuncius continuo fuit, qui tamen, poſt aliquod tempus, auxilii cujuſque puellulam videntes exſortem infortunioque obnoxiam, perpetuo per deum, perque homines, orarunt me ſupplices mature ſuccurrerem, ferre nec ſe nec miſellulam infantulam poſſe longiora ſupplicia.

Tum accedens paratis omnibus, quæ de more requiruntur, aureis ignitis ſcalpellis, ſanguineum offenſamentum omne ſum demolitus; ſanguis quid quidem fluere paratus et abunde fluens doſtris nonnullis adminiculis retroceſſit; curatum empyreuma per dies pluſculos; interea dum expreſſa de papilla per manum lacte ſuſtineretur infantulæ vita, perpurgata caro, cicatriculam recepit, vivitque puella læta jam annis et libera. Illud jam non eſt omittendum, natam infantem de matre ſanguineæ plenitudinis et corpore ſane præfarcto; ut videantur jam apte reſpondiſſe, ſuperflua fœtus concrementa generationi et ſanguinis affluentis undique primordiis.

Alter infans mihi ſeſe obtulit, hoc anno 1642, ſexto plus minus menſe natus, cujus labium item inferius mirabile viſu fuit; nam magnitudine prælatum, *ut pueri ipſius pugillum æquaret*, naturalem formam tum interne, tum externe excedens, colore violaceo, aliquando dilutius, venarum ſurculis quam creberrimis diſtinctum; figura linguæ teſtudinis marinæ, id eſt, craſſis ſeu bucca ſeu mento tenus initiis in quoddam quaſi roſtrum et in ſinum dedolatum ad ſummam de ore infimo exſtabat, modo pinnulæ pulmonis leporini; quæ quidem animantis pinnula, objecta matri fuerat cum utero geſtaret in eſum appetita medici menſibus: extra autem opinionem noſtram de ſuctu infantis ſciſcitati reſcivimus, in tam magno offenſamento neque amiſſum infanti ſuctum, et hoc etiam lac ſibi prolicere non difficile: ſic edocti ſcilicet et inſtructi à natura procedimus ad exſuctum, quam rem adulti vix ullo poſſumus ingenio comparare. De vitii vero curatione requiſiti reſpondimus, præterquam ablactatum infantem non adigendum in chirurgi manus, niſi grandiuſculum factum, tum futuram tutiorem curationem, quando vita pultibus et ſorbilibus ſuſtineatur; in cujus alioquin diſcrimen facile, hoc præcipue tempore, et per ulcus, et per ſanguinis compeſcendi, neceſſitates, ſublato ſuctu liquido conjiceretur; qui puer, et matre prognatus eſt ſumme melancholica atque hepate retorrido: ut peracri phantaſia illud monſtri pareret in ſuo genito; ſed de hiſce *natis* infantium ſub utereo impreſſis alias fortaſſe privatim.

† As in the caſe of Mr. R———, whoſe tumor, though it yielded a little to preſſure, was comparatively little affected.

‡ As in the boy N———'s caſe, where the tumor had large cells, and could be almoſt entirely flattened by the continued preſſure of the hand.

active veſſels, which will not be cured by opening it; all attempts at obliterating them with cauſtics, after a ſimple inciſion, have proved unſucceſsful, nor does the interrupting of particular veſſels which lead to it affect the tumor; the whole group of veſſels muſt be extirpated. In varicoſe veins, or in aneuriſms of individual arteries, or in extravaſations of blood, ſuch as that produced under the ſcalp from blows upon the temporal artery, or in thoſe aneuriſms produced in ſchool-boys by pulling the hair (and alſo in thoſe bloody effuſions from blows on the head, which have a diſtinct pulſation), the proceſs of cutting up the varix, aneuriſm, or extravaſation, enables you to obliterate the veſſel and perform an eaſy cure. But in this enlargement of innumerable ſmall veſſels, in this aneuriſm by anaſtomoſis, the rule is, " not to cut into it, but to cut it out." Theſe purple and ill-looking tumors, becauſe they are large, beating, painful, covered with ſcabs, and bleeding like a cancer in the laſt ſtage of ulceration, have been but too often pronounced cancers! incurable bleeding cancers! and the remarks which I have made, while they tend in ſome meaſure to explain the nature and conſequences of this diſeaſe, will remind you of various unhappy caſes, where either partial inciſions only had been practiſed, or the patient left entirely to his fate.

# DISCOURSE XII.

## ON FRACTURES OF THE LIMBS.

### INTRODUCTION, CONTAINING A HISTORY OF THE OPINIONS AND PRACTICES OF THE OLDER SURGEONS.

PERHAPS there is no ſubject more intereſting to the practical ſurgeon than this of fractures of the limbs; yet I would neither deduce its importance from the frequency of ſimple fractures, where the limb becomes ſhapely or remains deformed, according to the ſkill of the ſurgeon; nor from the ſhock which the whole ſyſtem feels in conſequence of a lacerated fracture, where fever and death not unfrequently enſue; nor from the deſtruction and cruſhing of the limb, protruſion of the bones, and laceration of the joints, which make injuries of the limbs almoſt as inevitably fatal as wounds of the great cavities: Nor, laſtly, from the difficulty which all liberal men acknowledge of deciding whether a limb thus ſhattered ſhould be ſacrificed or preſerved at the imminent riſk of the patient's life. Theſe are indeed natural difficulties, but they are ſuch as we ſhould feel very ſlightly, were not this one of thoſe ſubjects which has fallen into almoſt inextricable confuſion! none, I believe, requires more to be hiſtorically explained.

Aſk a young man who has ſtudied his profeſſion faithfully, what he would do with a fractured limb? he cannot tell. Aſk the ſame queſtion of one who has practiſed his profeſſion long, who has, moreover, practiſed it well and ſenſibly? He can hardly tell how he himſelf is accuſtomed to manage a fractured limb! He has no rule nor ſettled method! he waits for the particular caſe, truſts in his own conſciouſneſs of ſenſe and experience, and provides for difficulties only after they have come upon him. Aſk the man of books and ſtudy what have been the doctrines of the old, or what have been the actual improvements of the modern ſurgeons, he alſo is at a loſs! theories, bandages, machines, improvements innu-

merable, he can well remember; but together with theſe recollections this conviction always reſts upon his mind, that the ſubject which he has long regarded as the moſt intereſting, is the only one which he has in vain endeavoured to underſtand.

Degrading as this may appear to our profeſſion, it is, I fear, but too certain, that while more has been written on the ſubject of fractures than on hernia, lithotomy, amputation, or trepan, yet no two books correſpond, no two authors agree, even on the general points of practice; and every ſurgeon, whether in the army or in the navy, in a village or in a city, ſets a broken limb as he writes his name, after a faſhion of his own. There is no rule nor principle yet eſtabliſhed; this is almoſt the only department of practice which has been continually changing, without ever being improved.

When I revolve in my mind various methods of explaining this perplexed ſubject to you, the following points preſent themſelves as the moſt natural diviſions of my diſcourſe. They contain general views, which will enable me in the end to lay down correct and abſolute rules for your conduct, and will alſo, if I do not deceive myſelf, give ſome degree of conſiſtency and ſteadineſs to your practice.

*Firſt*, We will conſider the opinions, the prejudices, the formal operations, and the daring practices of the older ſurgeons, who took upon them to regulate the quantity, the form, and the conſiſtency, even of the callus; to pare it when exuberant, to repreſs it when unſhapely, and to break it when they were at any time diſpleaſed with the form of the limb. The diſcuſſion of their doctrines will ſerve as a general theory for the ſubject; and in the courſe of it I will attempt to explain to you the proceſs of healing as it goes on within a broken limb.

*Secondly*, I will explain to you the definitions and arrangements of fractures. Definitions are now too much neglected and contemned, becauſe the old writers delighted only in this falſe ſcience, and were ſkilful in nothing but intricate arrangements and unmeaning diſtinctions. But in truth, the definitions and diſtinctions of fractures are of the very higheſt importance; the very name of each ſpecies of fracture ſhould convey to the mind of the ſtudent, the idea of ſome peculiar deciſive line of practice. Good arrangements in our ſcience are like an artificial common ſenſe, by which thoſe who have not natural ability to decide upon any individual caſe, are taught their duty by its place in the ſyſtem! Arrangement is thus a neceſſary preliminary to general rules; and I ſhall ſo ar-

range my definitions, as that each ſubdiviſion of the ſubject may turn out a diſtinct and marked caſe.

*Thirdly*, I will explain to you the accidents of the hip joint, its luxations, its fractures, its lingering ſuppurations, caries, and anchyloſis; and I believe there is no ſubject within this department of fractures, which can be equally intereſting to you; for the joint lies buried ſo deep among the ſurrounding muſcles, that its accidents are apt to be miſtaken even by the moſt experienced ſurgeons, while protracted ſuffering, and incurable lameneſs, are the conſequence of the ſlighteſt miſtake.

*Fourthly*, The fracture of the thigh bone I ſhall conſider as a diſtinct ſubject deſerving particular notice. The retraction and ſhortening of the thigh is an unavoidable conſequence of the vaſt ſize and power of its muſcles; it is in this caſe alone that the limb is remarkably ſhortened; and the ingenuity of ſurgeons has been employed for ages in inventing machines to reſiſt this retraction, which, however ingenious, have produced nothing but torture to the patient, and diſgrace to the ſurgeon.

Yet theſe machines, imperfect as they are, ſhall be explained; and were there much of this kind to praiſe, it ſhould not be paſſed over in ſilence. But I may perhaps do you ſome ſervice by explaining the ſimple principles of this department of ſurgery, and then you will be able to enter into the magazines of Schultetus, Hildanus, and Paræus (filled with engines not unworthy of the chambers of the Inquiſition), without being tempted to bring out along with you any of their lumber.

*Fifthly*, While explaining theſe various ſubjects, I hope to make you gradually acquainted with the true principles of ſurgery; and it is only after having accompliſhed this, that I ſhall think myſelf entitled to lay down rules for each individual caſe, or to cloſe theſe diſcourſes with general aphoriſms.

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Perhaps you are chiefly anxious to learn how you are to bandage a fractured limb; but in the very opening of this ſubject, I muſt declare, that if there be any great and general error in ancient or in modern ſurgery, it is that of bandaging a fractured limb. It ſeems to have been by the number of turns, or rather by the number of bandages which they could roll round a limb, that ſurgeons at one period eſtimated their own ſkill. They have left us no doubt of their intentions, for this was their theory, and they were proud of it, "that while the callus was

ſtill ſoft, it was moveable, and you could mould it by compreſſion and bandages juſt as you could model putty in the palm of your hand."

The Arabians attended in a particular manner to the form of the callus; its exuberance was ſuppoſed to be a ſure conſequence of a ſlack bandage, the deformity of the limb was imputed to this cauſe, and was conſidered as a diſgrace to ſurgery; they took upon themſelves the whole management of the callus. Such was the firmneſs with which the Arabian ſurgeons applied their bandages, that not only while the callus was growing, did they draw their bandages within a very hairbreadth of producing gangrene, but they continued them afterwards to prevent the prominence of the callus, till, by their tightneſs, the limb was waſted; and much trouble had they in plumping it up again, "by filling the man with wine, and pleaſant tales, and luxurious bathing, and plaſtering the limb with pitch, to draw the nutritious juices that way *."

If all the ſurgeons of Europe had been bone-ſetters, merely learning their trade by tradition, they could not have delivered down the Arabian methods of firm bandaging more carefully than they have done. They have deſcribed, even in the moſt ſimple fracture of the leg or fore-arm, three or four bandages rolled one above another, with ſplints, and cuſhions, intricate and innumerable, as if a limb could never be too ſecurely tied. Each bandage was of many ells long. Of theſe three

* This waſting of the limb, its cauſes, and its cure, are explained in Albucaſis. The effect of ſuch bandages we muſt ſuppoſe to have reſembled expreſsly that waſting of the limb which lame ſailors and other mendicants contrive to produce by firm bandaging, and never fail to mark by a red garter twiſted round the limb. Quando reſtauratur fractura oſſis, et remanet membrum poſt illud ſubtile, debile: tunc non fit illud niſi propter cauſſas multas. Quarum una eſt, multitudo ſolutionis ligamenti et ligationis ejus non ſecundum quod oportet: aut propter ſuperfluitatem ſtricturæ ligamentorum, donec prohibeatur nutrimentum currere ad membrum: aut propter multitudinem embrocationis ſuperfluæ in non ſua hora: aut propter paucitatem ſanguinis in corpore infirmi, et debilitatem ejus. *Et curatio illius eſt, cibare infirmum, et tenerum facere corpus ejus, donec multiplicetur ſanguis in eo. Et adminiſtra balneum. Et intromitte gaudium et læticiam ſuper eum. Deinde pone picem ſuper membrum: ut attrahat pix ad ipſum nutrimentum multum.* Et aſſiduet embrocationem ejus cum aqua tepida, donec currat nutrimentum, et redeat ad figuram ſuam naturalem.

We are ſorry to ſee one ſo often quoted, and of ſuch high authority in ſurgery as Fabricius, copying the abſurdities of Albucaſis, directing the ſame nouriſhing diet, the ſame warm bathing, with this pitiful conceit of his own, "to bathe the patient in pure water, in which it will not be amiſs to boil ſome beef."

"Si membrum gracile reddatur vel remaneat propter nimiam faſciarum ſtricturam, &c. Æger nutriendus eſt deinde adminiſtrandum balneum ex aqua dulci, *in qua ſi aliqua portio carnis decoquatur erit melius.*" FABRICIUS.

rollers, the firſt was paſſed round and round the part immediately fractured; by which rolling, and by certain compreſſes, which they ſometimes laid in a circular direction about the fracture, they expected to regulate the ſhape of the callus, to prevent knots, and to limit its growth. The ſecond paſſed ſpirally round the leg or arm, all its turns winding from below upwards; for this ſpiral bandage they could not give ſo fair a reaſon, but of the third roller they could give a good account; the third roller paſſed ſpirally round the limb from above downwards, "to antagonize the ſpiral turns of the ſecond." Over theſe three rollers, were laid cuſhions or pads of linen, folded of ſuch thickneſs as to have the effect of compreſſes, four of which, moiſtened in ſpirits and vinegar, were laid along the limb. Theſe alſo were for the purpoſe of regulating the callus, and were kept in their place by being rolled with a fourth bandage *. Over theſe bandages and compreſſes were laid the ſplints, made ſometimes of ſtiff paſteboard or thin deal, ſometimes of ſticks with ſtraw rolled round them, ſometimes of plates of metal, as braſs or ſteel; and theſe ſplints, which were (as the marginal drawing, page 495. expreſſes) much too ſhort to have any command of the limb, or to make any compenſation for the ſuffering of the patient, were ſecured with a fifth roller, which is ſeen in this drawing of Schultetus. Nay, even ſuch a writer as La Motte is proud of having dreſſed a leg, which was broken in two places, with two different ſets of ſhort ſplints, one near the ancle, and another near the knee †.

The leg, at every turn of each of theſe five rollers, was lifted up and handled, with great torture to the patient! When this bandaging was finiſhed, the limb was as big as his body; and long before it was brought to that ſize, the ſurgeon

* When the callus was knotted, and the leg clumſy, it was always aſcribed to the unſkilfulneſs of the ſurgeon. Witneſs the following paſſage from the great Petit.

"Le cal eſt difforme pour n'avoir pas été ſuffiſamment borné par le bandage, ou parce que les os n'ont pas été bien réduits. Il n'eſt pas toujours poſſible de borner l'accroiſſement du cal, particulierement quand la douleur, l'inflammation et autres accidens empechent de faire un bandage ſerré; mais il arrive ſouvent que le cal n'eſt difforme *que par la faute du chirurgien*, comme lorſque ſans raiſon, *il ne ſerre pas ſuffiſamment et également le bandage*, pour s'oppoſer de toutes parts à ce que le ſuc oſſeux ne s'épanche dans le voiſinage de la fracture. La difformité du cal eſt plus grande dans les fractures qui n'ont pas été bien reduites, tant parce que les bouts de l'os montent l'un ſur l'autre, que parce que le bandage ne *peut pas comprimer également, ni par conſéquent borner, comme il conviendroit, l'accroiſſement du cal.*"

† Theſe ſplints of ſtraw, &c. were not flat like ours, but made of a pretty thick rod, like the thickeſt hazle ſwitch, and wrapped round with ſtraw till it became as thick as a batton. One was laid along each ſide of the fractured leg.

and all his aſſiſtants were exhauſted with the work *. The old ſurgeons were as curious in the days appointed for taking off theſe bandages, as a midwife about the periods of giving ſuck after delivery, or riſing from bed, or going to church. They took off the ſplints on one appointed day, the pads or cuſhions on another, and the innermoſt rollers on a third. They had even a bandage which they put on during the weeks of convaleſcence, after thoſe with which the limb was firſt dreſſed were removed.

Theſe were bandages which none but a regular ſurgeon could apply; and to ſay the plain truth, I think we have very innocently followed down to the preſent day practices contrived in mere cunning, and which had no other purpoſe than to preſerve the trade of ſurgery, in all its branches, to its rightful owners †.

On theſe bandages the whole of the cure ſeemed to reſt, and therefore the ſurgeons were inexorable in refuſing to take them off before the day appointed by canons of ſurgery. No wonder that they permitted their patients to ſuffer any degree of pain, to fret during the day, and cry during the night, rather than un-

* Pott repreſents the proceſs, even in our own times, as ſo tireſome, "that the labour of rolling a limb is among his objections to the practice." *Vide* page 401.

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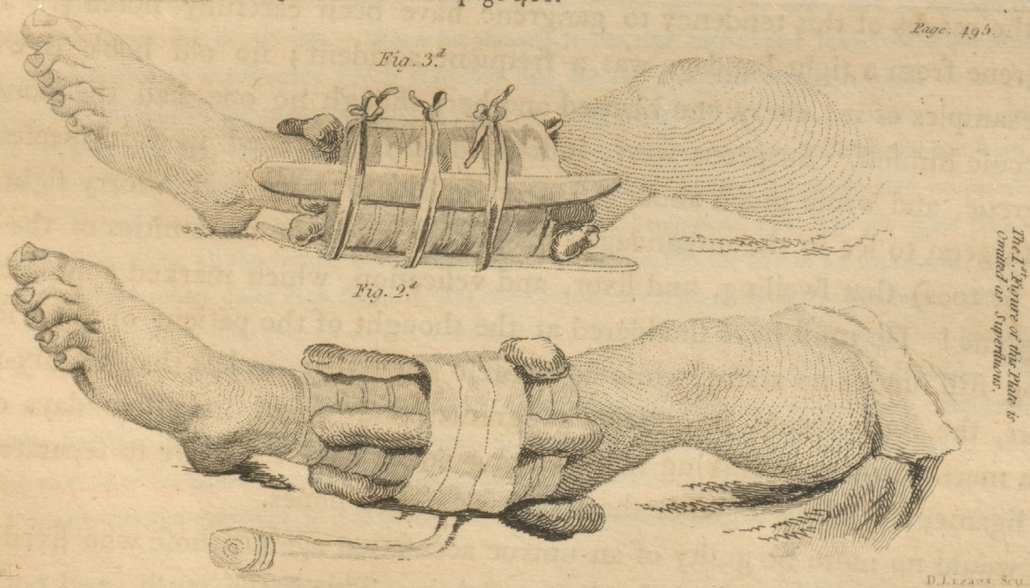



† In this marginal plate I have repreſented the three ſtages of this important proceſs of the ſetting a fractured limb. In Figure 1. is ſeen the manner of applying the firſt roller, to moderate the efflux of callus; in Figure 2. is ſeen the manner of applying the compreſſes of linen over the firſt and firmeſt roller; and in Figure 3. is ſeen the manner of applying the ſplints on the outſide of all the reſt of the apparatus.

dertake to undo an apparatus ſo abſurdly complicated. Verduc ſays *, " Let the patient cry or roar ever ſo much, this is ſtill a certain rule, that if your bandage is right, all the moſt conſiderable pain will ceaſe in twenty-four hours; for ſuch patients make a great deal of noiſe and whining for a trifling pain." This advice of Verduc's needs no comment, it implies that theſe ways of bandaging were attended not only with pain but with danger. The degree of ſwelling in a bandaged leg was watched with extreme anxiety. It was in the ſurgery of thoſe days a canonical rule, that the limb ſhould be ſo bandaged, that there ſhould be a ſlight degree of tenſion and ſwelling, ſo as to indicate a degree of ſtraitneſs in the bandage, but not much, leſt the limb ſhould fall into actual gangrene. Thus the patient lay in imminent danger; the apparatus was ſuch as could not be eaſily undone; the ſurgeon was often far off; the patient thought it his duty and his intereſt to bear that pain which he was made to believe was neceſſary to his cure. Even when the ſurgeon was preſent, he had ſo little regard for his patient as to let him " roar and cry" ſometimes a little too long; and the conſequences of this are well known, for the tightneſs of the bandage of a fractured limb has been mentioned among the cauſes of gangrene in all the books of ſurgery, and the marks of this tendency to gangrene have been carefully noted †. This gangrene from a tight bandage was a frequent accident; no old book is without examples of it; every one blamed another, though no one had the honeſty to accuſe himſelf. Surgeons were, indeed, deeply intereſted in this ſpecies of gangrene, and wrote much about it; it muſt, indeed, have been a ſorry ſight for the ſurgeon to ſee in the unbandaged parts (that is, in the extremities of the fingers or toes) that ſwelling, and livor, and veſication, which marked approaching gangrene! He muſt have ſhuddered at the thought of the patient or his friends being ſtill under no alarm, while he himſelf knew that, in leſs than twenty-four hours, the limb would be entirely gangrened, and would in a few days drop off a mere putrid and ſtinking maſs, leaving nothing for the knife to ſeparate but the ligaments holding together the black and naked bones.

I would no more be guilty of an untrue accuſation againſt thoſe who lived two hundred years ago, than againſt a living author. This is the truth, and nothing but the truth, and might be my warrant for rejecting altogether this practice of rolling broken limbs.

* Page 399.

† Mr. Gooch, Dr. Aitken of Edinburgh, in their Treatiſe on Fractures.

In the preſent day, though there are doubtleſs few ſo entirely ignorant as to think of modelling the callus by the tightneſs of their bandage, yet there is hardly any ſurgeon who does not think it his duty to bandage a fractured limb, for there is an apprehenſion of another kind which has taken ſtrong hold on the public mind! It is a more rational, and therefore a more dangerous prepoſſeſſion, "that the ſlighteſt motion will diſcompoſe the callus, that frequent accidents will prevent its being formed at all *." And worſt of all, it has been univerſally believed (to uſe the words of the very lateſt writers on the ſubject) "that the ſmall-

* There can be no doubt that perpetual motion will prevent the continuity of veſſels betwixt the ends of a fractured bone being reſtored, juſt as perpetual motion would prevent the adheſion of an external wound; and you may imagine, that when the ends of the bones are by continual motion prevented from uniting, they will become ſmooth. You can alſo eaſily imagine, that while the continuity of the veſſels of the bones is obſtructed, the membranes and ſurrounding parts will heal, and will ſeem to ſurround with a capſular membrane that cavity which is preſerved by the motion of the bones.

This is what is called an accidental or unnatural joint, which happens moſt frequently after fractures of the two bones of the fore-arm, though ſometimes it happens in fractures of the ſingle bone of the arm. When the fore-arm is broken, the patient, after the firſt inflammation has ceaſed, feels not much pain; and if he perſiſt in moving his arm, he at laſt moves it with eaſe, and eſtabliſhes his unnatural joint. An old woman came to me with her fore-arm broken; the broken part of the arm bent ſo that the hand hung dangling to one ſide of the arm. When ſhe ſhowed it me, ſhe turned and toſſed the looſe hand in the air with a degree of indifference which ſurpriſed me, for the arm had been but eight days broken. I ſet the arm with ſplints, put many firm rollers about it, ſlung it round her neck, and alſo tied it with a roller to her ſide, and gave thoſe operations an air of importance, to prevent her undoing the bandages.

She was one of thoſe tipſy, crazy creatures, that you hardly know whether to think mad or drunk. I dare ſay ſhe was no ſooner out of my ſight than ſhe undid all the bandages. She kept an apple ſtall, and never reſted from doing all the trifling things about it. She returned to me five or ſix times with her arm, ſometimes with the rollers quite ſlack about it, but more frequently without ſplints or bandages, till in the end ſhe had an unnatural joint formed within three inches of the wriſt. A ſhoemaker who had broken his fore-arm, would not be reſtrained from working at his trade, and an unnatural joint was formed. When the bones fail to unite, they move like a ſecond wriſt, and the hand is weak, or rather uſeleſs. Sometimes, notwithſtanding the difficulty of the radial and ulnar arteries, the ſurgeon has cut upon the wriſt, puſhed out the two ends of the bones through his inciſions, pared the ends of the bones, and replaced them; and laying the arm after the operation on a ſteady ſplint, like a compound fracture, the bones have perfectly reunited.

This is an accident long ago obſerved. Du Verney, page 129. mentions the diſſection of a man who had ſuch a joint formed about four fingers breadth above the wriſt; the upper ends of the two bones, the radius and ulna, were united by a clumſy callus at the place of the fracture; and on the face of that broad callus was formed a ſort of ſocket, which received the lower fractured ends of the bones, which were ſmooth, and accommodated to the ſocket; the ſocket, indeed, was moulded upon the ends of the bones.

eſt alteration of poſture, for the ſake of eaſe, will often defeat all that has previouſly been done *." The old doctrine goes upon new wheels; the ancients uſed firm bandages to keep down the callus, and modern ſurgeons uſe firm bandages to keep the limb ſteady during the cure.

I need quote no authority for what every one believes, for a principle which is univerſally regarded as the very chief foundation of all our practices and precautions. I do not know a man who would not be ready at this moment to defend this opinion, that the ſlighteſt motion will deſtroy the callus and retard the cure; but I can hardly imagine any one ſo hardy as even to acknowledge this prejudice, after the real ſtate of oſſifying callus is explained. When we ſhall have examined into the genealogy of this doctrine, and compared it with certain facts, you will, I doubt not, agree with me, that it is ill entitled to a place in our theory, and by no means deſerves to be reſpected in practice.

Every thing plainly ſhows that the older ſurgeons believed callus to be a mere inorganic concrete, a fluid poured out from the extremities of the ruptured veſſels, which was ſoon hardened into bone; that it ſet or hardened like ſtucco or Paris plaſter, and if not diſcompoſed during this proceſs, hardened into the conſiſtence of bone. They deſcribed it always as "an exſudation of the bony juice," and certainly imagined it to run like lead from a plumber's ladle, and, like it, to concrete, after being poured out from the ends of the bones. They thought callus a juice which diſtilled from the ends of the broken bones as gum from trees, ſometimes too profuſely, ſometimes too ſparingly. The reunion of broken bones, and the hardening of this callus, they familiarly compared with the glueing together of two pieces of wood, or the ſoldering of a broken pot †. The callus they ſuppoſed to be a peculiar juice circulating in the bones, ready to be poured out, ſo

This is moſt probably the preparation of the wriſt of the ſtreet porter mentioned by Palfin in the following terms:

"Un Porte-faix de Paris, qui eut les deux os de l'avant-bras fracturez, n'ayant pas voulu ſe faire panſer ſelon les regles de l'art, mais à ſa fantaiſie, les os ne ſe conſoliderent pas, et le ſuc nourricier s'étant épanché ſur l'extrémité des os, s'oſſifia de maniere que l'avant-bras ſe mouvoit à l'endroit fracturé, comme il auroit pu faire dans une véritable articulation. Cet homme étant mort quelque tems après, le chirurgien, qui avoit été obligé de faire le bandage ſelon le caprice du bleſſé, eut la curioſité d'examiner les os de ſon avant-bras, qu'il trouva badiner dans un cercle oſſeux, ſans être réünis à leurs extrémitez. On a conſervé ces os, que j'ai vû démontrer plus d'une fois à Mr. Duverney, au Jardin Royal des Plantes."

* *Vide* Mr. Gooch, Dr. Aitken of Edinburgh, in their Treatiſes on Fractures, &c.

† "Car ainſi que l'on joint les preces de bois avec de la colle ou les potiers d'eſtain leur pots. Ainſi nature cement les os rompus avec le callus." AMBROSE PAREE, p. 343.

as to reunite them when fractured * ; and they imagined that it ſometimes flowed into the joints ſo as to cauſe anchyloſis, and often caked and knotted about the broken bones ſo as to form a clumſy, prominent, unſightly lump. They imagined that callus was a juice which infallibly congealed in a marked period of time, and therefore they appointed particular days for undoing the bandages of each particular fracture. They ſuppoſed that its exuberance might be ſuppreſſed by a firm and well rolled bandage, its knobby deformities corrected by pillows and compreſſes ; that it might be thumbed and modelled by preſſure into a perfect ſhape ; that it might be ſoftened by friction and oils ſo as to be twiſted and ſet anew ; and it is believed even at this day, univerſally believed, that if the callus be diſcompoſed in the ſlighteſt degree while forming, it may perhaps never ſet. All their notions were mechanical, their moſt favourite illuſtrations were juſt what I have ſtated, their whole doctrine was abſurdly conſiſtent, not with nature, but with itſelf ; and this doctrine has been the apology for all contrivers of machines, from the time of Hildanus down to Dr. Aitken and Mr. Gooch, the great mechaniſts of the preſent day.

We cannot wonder that medical writers have been fond of criticiſm, for the demoliſhing of an old doctrine is half the buſineſs of eſtabliſhing a new one. But the expoſing of a theory ſo ignorant and ſo dangerous as this, if it do not help us to a true doctrine, at leaſt turns our minds vigorouſly towards the ſearch of truth. In trying to underſtand the proceſs by which callus is formed, ſurely we can compare it with nothing ſo properly as the original formation of bone.

The abſorbent ſyſtem is of more importance than is generally obſerved ; for while the abſorbents have been repreſented as uſeful only in removing the excrementitious and ſpoiled parts of the body, in taking up extravaſated fluids, removing tumors, or conveying away parts corrupted by diſeaſe ; theſe are, in truth, but trivial and occaſional functions of the abſorbents, which are the great means of forming, preſerving, and indirectly of nouriſhing the ſyſtem. The neceſſity

Nor is this the peculiar doctrine of the age in which Parée lived, it is the doctrine of the French Academy. We find in every page of their works ſuch expreſſions as theſe, " Un exemple ſingulier de l'effuſion irregulier des *ſucs oſſeux congelés en forme de ſtalactytes*."

Pott continually repeats expreſſions of the ſame import, as, " that callus is a particular juice circulating in the bones for their particular nouriſhment." " This callus or uniting medium," &c.

* " Generatur autem callus ex oſſis alimento, quod a labiis fracturæ exſudans circum oſſa fracta concreſcit. Et licet non ſit os, ita tamen durum eſt, ut ſi membrum illud rurſus frangi contingat," &c.

of a continual ſupply of food, implies an inceſſant waſte and abſorption; the parts muſt be taken up by the abſorbents before they be replaced by the arteries. The actual materials of which the living body is compoſed are in perpetual fluctuation; all its parts are continually ſecreted anew; the ſecretion of the parts is expreſsly proportioned to the action of the abſorbent ſyſtem, which is ever making room for new depoſitions. While the parts of the living body are thus inceſſantly changing, the inceſſant change prevents any hurtful chemical proceſs from taking place in the living body; it is this perpetual renovation of parts that gives the character of living matter to every coarſe and common aliment which we receive into the ſyſtem, and which is alternately aſſimilated and thrown off; the whole materials of our ſyſtem are inanimate, yet the whole ſyſtem is alive; motion, aſſimilation, and growth, diſtinguiſh living matter; and it is this perpetual change that gives to the inanimate matters which are aſſimilated with the ſyſtem the properties of a living body. Theſe proceſſes, of inceſſant abſorption and depoſition, are turned occaſionally towards the reproduction of loſt parts; and it is this which we have to conſider in trying to inveſtigate the reunion or reproduction of any part whatever, whether ſeparated and cut off by wounds, or killed by diſeaſe; for nutrition in health, and reunion, regeneration, and recovery from diſeaſe, are but various modifications of one proceſs.

A bone is a well organized part of the living body; that matter, which keeps its earthy parts together, is of a gelatinous nature; the earth of bone, to which it owes its hardneſs, ſtrength, and all its uſeful properties, is depoſited in the interſtices of this gluten, undergoing a continual change and renovation; it is inceſſantly taken up by the abſorbents, and ſecreted again by the arteries. It is this continual abſorption and depoſition of earthy matter which forms the bone at firſt, and enables it to grow with the growth of the body; it is this unceaſing activity of the veſſels of a bone, which enables it to renew itſelf when it is broken or diſeaſed; it is, in ſhort, by various forms of one ſecreting proceſs that bone is formed at firſt, is ſupported during health, and is renewed on all neceſſary occaſions. Callus is thus a regeneration of bone, organized by the ſame action with that by which the original bone is formed. The callus begins to be formed after a fracture, as ſoon as the continuity of veſſels is re-eſtabliſhed, and their healthy action renewed. Bone is a ſecretion (as, indeed, the whole ſolids of the living body are but a ſecretion) originally depoſited by the arteries of the bone, which arteries are employed in renewing it continually. It is not a concrete juice, depoſited

merely for the occaſion of filling up the interſtice betwixt fractured bones, but a fair regeneration of new and perfect bone, with its needful apparatus of arteries and veins, and of abſorbents, by which its earthy matter is continually changed like that of the contiguous bone. Callus, indeed, could hold no connexion with the contiguous bone, were it that inorganic concrete which was once ſuppoſed *.

Even after exchanging the old doctrine for a more perfect phyſiology, ſurgeons have continued ſtill under this apprehenſion, that the ſlighteſt motion would diſturb, or totally ruin a callus juſt about to form. But it is an ignorant fear, proceeding merely from not having obſerved the ſtate of the parts; for, in truth, when callus forms, the perfect conſtitution of the bone is reſtored; the arteries pour out from each end of a broken bone a gelatinous matter; the veſſels by which that gluten is ſecreted, expand and multiply in it, till they form betwixt the broken ends a well organized and animated maſs, ready to begin anew the ſecretion of bone. Thus you may perceive, by the plaineſt induction, that the ends of the bones are, when the bony ſecretion commences, much in the condition of ſoft parts which have recently adhered; and it is only when there is a want of continuity in the veſſels, or when want of energetic action incapacitates them from renewing their ſecretion, that callus is imperfectly formed. This is the reaſon why, in ſcorbutic conſtitutions, in men infected with ſyphilis, in pregnancy, in fever, or in any great diſorder of the ſyſtem, or where the wound of a compound fracture is ſtill open, no callus is generated †.

It reſults from this doctrine, that callus is eſtabliſhed in a renewed continuity

* How could we otherwiſe, than by this doctrine, account for the reproduction of bone, where large pieces are loſt? Sometimes the wheel of a waggon ſqueezes out a piece of the tibia two inches long; or a part of a bone is deſtroyed by caries, and is exfoliated; or a piece of a long bone is boldly cut out by the ſurgeon. If, for example, three inches of the tibia, or of the radius, are thus ſawed out, the other bone, the ulna, or the fibula, keeps the limb of its right length, the two cut ends do not approach each other; we ſee them healing by a ſpongy intermediate fleſh; we ſee nothing but red, lively, bleeding granulations filling up the interſtice; and when the cure is accompliſhed, we find that the ſecretion of bone is perfect. and the limb ſtrong, and the new bone quite hard.

† A foot-note of Mr. Pott's is the beſt comment upon this aſſertion. "There is one circumſtance relative to compound fracture which may, perhaps, be deemed worth noting, which is, that I do not remember ever to have ſeen it neceſſary to amputate a limb for a compound fracture, on account of the too great diſcharge, in which the fracture had been united. In all thoſe caſes where the operation has been found neceſſary, on account of the drain of matter, the fracture has always been perfectly looſe and diſunited. *Foot-Note to* POTT'S *Treatiſe on Fracture*, P. 474.

of veſſels; that a ſoft, flexible, and vaſcular ſubſtance is interpoſed betwixt the ends of the broken bones; that a ſort of temporary gland is organized for the generation of bone, or, to ſpeak not figuratively, but philoſophically, it ſeems as if, by this reunion of all the adjoining parts, the original conſtitution and proper organization of a bone were reſtored. But for ſome time the ſecretion of earthy matter is imperfect; it is infant bone, ſoft, flexible, of an organization perfect for all the purpoſes of bone, but as yet delicate and unconfirmed; not a mere concrete, like a cryſtallization of a ſalt, which, if interrupted in the moment of forming, will never form; not liable to be diſcompoſed by a ſlight accident, nor to be deſtroyed entirely even by a rude ſhock! Young and unformed callus is a ſubſtance ſoft and fleſhy, ſo that it yields; ligamentous in its conſiſtence, ſo that it is not very eaſily injured; and in its organization ſo far perfect, that when it is hurt, or the bony ſecretion interrupted, the breach ſoon heals like the adheſion of ſoft parts, and ſo the callus becomes again entire, and the proceſs is immediately renewed.

But as this is a theory which is to have ſome influence on your practice, it muſt not be ſlightly treated; but muſt be ſupported with ſomething more ſubſtantial than hypothetical reaſoning. I ſhall proceed, therefore, to ſtate facts.

Towards the end of the cure of a fractured limb, the patient becomes careleſs and confident, and often by his playing tricks with his crutches, or by the crutches ſlipping or breaking through his negligence, he loſes his balance, throws all the weight of the body ſuddenly on the weak limb, and thus breaks it a ſecond time. And here a phenomenon preſents itſelf, which very ſtrongly confirms our doctrine. It is, indeed, contrary to the vulgar opinion, but yet it is certainly true, that when a limb is broken a ſecond time, it reunites more eaſily than at the firſt, and when broken a third and a fourth time, heals ſtill faſter and faſter. A little girl, a daughter of Mr. Y. had her arm three times broken, and at each time I found it unite in a ſhorter period than the preceding. A young man, a ſervant with Mr. G. having broken his leg, it bent and broke under him three ſucceſſive times, and at each ſucceſſive fracture it healed more and more eaſily.

" An officer whoſe leg had been reduced by a French ſurgeon, and who was recovered ſo as to walk abroad, fell and broke it a ſecond time, about the fiftieth day of the cure. The limb being reduced and laid again in ſplints, was ſo well oſſified in twelve days, that the ſurgeon took off the ſplints, the pa-

tient was able to lift his leg; it bore its own weight quite eaſily, and by the twentieth day it bore the weight of the body; he walked abroad, uſed all manner of freedom, and was cured a ſecond time, and by the twenty-fourth day he was able to walk without any other help than a cane. But this ill-fated leg was deſtined to be broken a third time; for, this gentleman having mounted his horſe in order to go and join his troop, the firſt ſtep of his journey was a very diſaſterous one! His horſe plunged in among ſome clay, he fell, and the horſe, in kicking to clear himſelf, broke both the boot and the rider's leg *. This third fracture was ſtill more eaſily reunited than the ſecond, for in leſs than ſix weeks he went to his regiment with the leg ſtrong and firmly joined, and ſo accurately, that it was not eaſy to diſtinguiſh the broken leg from the ſound one."

In all theſe caſes the limb yields, it bends under the weight of the body, it is broken ſo that it can no longer ſupport the weight of the body, but without any ſnapping or ſharp ſplintering of the bone, and, in general, without any overſhooting of the bones, and without crepitation. It is chiefly by the change of ſhape in the limb, by its bending ſomewhat, that you know it to be broken.

Every accident of ſuch a caſe is perfectly conſiſtent with the doctrine which I have laid down, and proves it very ſtrongly. Callus is really more vaſcular than bone, and of this we are aſſured by various proofs. Having cut off the limb of a ſoldier, whoſe leg had been broken in America twelve years before, I found, upon injecting the bone, that while the bone itſelf received the red colour of the injection pretty freely, the callus, which goes in a zig-zag form, joining together the ſeveral ends and points of a very oblique fracture, was very ſingularly red. The callus, then, is more vaſcular than the bone which it belongs to, even at the diſtance of twelve years from its formation. This callus, unconfirmed at the time that it is broken, is ſoft, and very highly vaſcular. When the callus breaks, many of its veſſels are ruptured, but ſome are only elongated, and it rarely happens that its whole ſubſtance is torn. You may eaſily imagine how much more readily the continuity of veſſels will be renewed within the ſubſtance of the limb, when the bone or callus is ſurrounded by vaſcular parts ready to ſwell and cloſe up the breach, than in any external wound.

* The meaning of the horſe breaking the boot as well as the leg, will not be underſtood by thoſe who are not acquainted with the peculiar manner of accoutering a bidet or hack-horſe in France. It has two large fixed wooden boots, ſlung on each ſide of the ſaddle, and when the rider mounts, he thruſts his leg boot and all into theſe wooden boots.

When we conſider the perfect vaſcularity of a callus, its ligamentous toughneſs at the period of its being thus rudely bent; the excitement which muſt follow this partial rupture, and the full and vigorous circulation in veſſels accuſtomed to the ſecretion of bone, we underſtand why a fractured callus is more ſpeedily reunited than a broken bone, where nothing is prepared for the generation of new bone.

I think I cannot illuſtrate the condition of a callus, at the time that it is broken, better, than by comparing it with the condition of a bone, where, by the perpetual reſtleſſneſs of the patient, a proper callus has been prevented, where the bones have covered themſelves with a ſort of cartilage, and an unnatural joint has been formed; where the ſurgeon makes an inciſion, turns out the ends of the bone, pares off the callus from each end of the bone, returns the pared ends of the bone again into their place, and lays them among the fleſh, oppoſite to each other, and ſews up the wound! then adheſion takes place, the communion of veſſels from bone to bone, and alſo the continuity of all the ſurrounding ſoft parts, is reſtored; then all the ſurrounding veſſels are drawn into action, a maſs of parts, active and in high circulation, is formed round the broken bone, the blood and humours are worked towards it, and the veſſels of the bone itſelf being thus ſupported in their new action, the oſſific proceſs is renewed with great energy. This is the reſult of an experiment, or rather of an operation, which has been ſeveral times performed, and particularly by Mr. Park of Liverpool, and is a fine analogy for explaining the condition of a fractured callus; for in proportion as the organization is advanced, and the parts full of blood and in high excitement, the ſecond fracture is more rapidly re-united than the firſt.

This accident, of breaking the leg a ſecond time, is in no caſe ſo grievous a misfortune as might be imagined; in a very ill reduced fracture, I ſhould rather eſteem it fortunate. It was the practice of ſurgeons in all ages, to ſnap the limb acroſs their knee whenever they were ill pleaſed with the ſhape of it; and although, in the preſent day, ſuch a practice would be eſteemed a mark of the groſſeſt ignorance, it is but one example out of ten thouſand, where opinions which now paſs only among the vulgar, may be traced to the higheſt and moſt reſpectable authorities.

That the ancients had very generally engaged in this practice, I could eaſily prove by direct authority; but, indeed, there can be no proof more ſatisfactory than what is to be found in the writings of thoſe who were averſe to the prac-

tice. " When a limb is unfortunately ſo united that it is crooked, knotty, and deformed, but ſtill uſeful, you muſt by no means hearken to the advice of *thoſe who direct* you to break it a ſecond time ; a thing which has been but too much practiſed in theſe countries (viz. in Arabia) by fooliſh phyſicians and bone-ſetters. The operation is dangerous, it is even fatal *."

One ſhould have believed Albucaſis, from theſe manly and determined expreſſions, to have been quite above ſuch follies. But he has a beam in his own eye, while he is plucking the mote out of his brother's ; for this ſame Albucaſis is full of directions for ſoftening, for paring, for chiſſelling, for ſawing, and for raſping away exuberant callus, which ſometimes he tries to ſoften, and ſometimes to conſtringe by ſtyptics. " Often (ſays Albucaſis) the callus, eſpecially when near a joint, is knobby, deformed, and even cauſes lameneſs of the limb. Then you are to conſider whether the callus be recent ; then you uſe ſtyptics, aloes, olibanum, myrrh, and accaſſia, and prepare them with wine, vinegar, or whites of eggs ; bind ſuch an aſtringent firmly over the lumpy callus, and renew this firm bandaging and theſe powerful aſtringents till the protuberance be diſpelled ; or bind round it plates of lead, for lead is a metal very friendly to the human body †."

" If the callus have already concreted and become firm, and you be in haſte to rid the limb of it, then make an inciſion, and raſp off the protruding part with ſaws ‡."

When Albucaſis directs theſe operations merely for exuberant callus, we may well

* Quando accidit membro jam reſtaurato poſt ſanationem ejus tortuoſitas, et eminentia oſſi fracto, aut nodatio : et fœdatur per illud forma membri, verumtamen membrum non prohibetur ab operatione ſua naturali : tunc non oportet ut recipias ſermonem ejus, qui exiſtimat, ut frangatur membrum denuo. Et jam fuerunt multi ſtolidorum medicorum et reſtauratorum, qui fecerunt illud in terra noſtra. Et hæc quidem operatio eſt vituperabilis valde, perducens ad mortem, vel timorem magnum, ut ſcilicet ſit mortalis.

† Multoties accidit hæc nodatio in veſtigio ſanationis fracturæ. præcipue, quæ eſt prope juncturas : et fœdatur ex ea figura membri. Et fortaſſe prohibet membrum ab operatione ſua naturali. Conſidera ergo tunc, ſi nodatio eſt recens : adminiſtra in ea medicinas quæ ſtipticitatem habent. ſicut aloe, et olibanum, et myrrha, et ſarcocolla, et acacia, et ſimilia eis. Ita, ut accipias ex iſtis quaſdam, aut omnes eas : et confice eas cum vino ſtiptico, aut cum albumine ovi, aut cum aceto : et pone eas ſuper nodationem in ſtuppa, et ſtringe eas ſuper ipſam ſtrictura bona. Et dimitte ſtricturam, nec ſolvas eam diebus multis. Deinde ſolve eam, et itera aliam, donec removeatur nodatio. Aut ſtringe ſuper ipſam laminam plumbi decenter. Plumbo enim eſt proprietas removendi omne quod timetur ex membris.

‡ Si autem nodatio jam in lapidem converſa eſt, et ſtricta eſt, et feſtine provocat neceſſitas ad auferendum eam : tunc finde ſuper eam ex ſuperiori parte ejus, et incide ſuperfluitatem eminentem : aut rade eam cum quibuſdam raſoriis, donec removeatur : et cura ipſam, donec ſanetur.

wonder what kind of operations he has in reſerve for a lame and diſtorted limb. He repeats the ſame proceſs; he does not, indeed, direct aſtringents, thoſe are uſed only to repreſs the ſpongineſs of recent callus; the confirmed crookedneſs of a deformed limb is to be overcome by ſoaking it in emollient fomentations of melilot or mallows, or it is to be ſoftened with the mucilage of mallows, oil of ſeſamum, and cock's greeſe. But his laſt hope ſeems to have been in the pigeons dung, fat figs, and other medicines, termed among the Arabians, Medecina Conſolidationem Minuentes, Attenuating Medicines, rubbed in with the warm hand *; but if theſe failed, he who would by no means break the leg, directs his pupils, "if the diſtortion be old and firm, to cut acroſs the bone, and ſaw off all that is ſuperabundant, whether of the bone or of the callus. Study and practice (ſays Albucaſis) will make you very expert in the operation †." Thus the prudent and ſagacious Albucaſis, who would by no means hear the advice of theſe ignorant phyſicians and bone-ſetters, who adviſe to break the leg and ſet it anew, deſcribes in various places how to ſaw or ſcrape, or cut away with ſaws or chiſſels, any unſightly callus.

If Albucaſis be more particularly to blame, it is becauſe what others recommended only, he abſolutely performed; but the doctrine was as old as the ſcience of ſurgery itſelf. Theſe operations are ſervilely copied from the ancients by many modern ſurgeons; they have tranſcribed the very words from Paulus ‡. In no

* Verum ſi claudicatio et nodatio ſunt recentes: tunc oportet, ut embrocetur cum aqua tepida, in qua decoctæ ſint herbæ mollificantes. ſicut folia alteæ, et radix ejus, et mellilotum, et illis ſimila. Et fiat ei emplaſtrum cum emplaſtro mollificativo. ſicut dyachilon decenter factum. Aut ſumatur mucilago radicis alteæ, et concutiatur cum adipe gallinæ, aut oleo ſiſamino: et emplaſtretur cum eo. Aut ſumantur ficus pingues, et terantur cum ſimo columbino, et ſimilibus eis quæ nominantur ex medicinis diminuentes conſolidationem. Et quandoque ſolvitur nodatio cum fricatione aſſidua, antiqua, et leni, quæ ſit cum manibus humidis.

† Si autem tortuoſitas jam anteceſſit, et ſortis facta eſt, et converſa eſt in lapidem, et provocata eſt neceſſitas ad curationem ejus cum ferro: tunc oportet, ut ſecetur ſuperius ejus, et ſolvatur continuatio oſſis et incidatur quod ſuperfluit ex nodatione aut oſſe cum inciſoriis ſubtilibus: et adminiſtretur facilitas in illo cum ſollicitudine et ſtudio.

‡ Quibus membrum diſtortum callus firmaverit difficultate, functicauſu obeundorum haud exigua ſubſequente, preſertim ſi in pedibus fuerit repoſitionis quidem modus vidi recipiendus eſt, ut qui extrema inferat diſcrimina. Verum ſi callus nondum radices egerit luxantibus ſuperfuſionibus, et cataplaſmatis exſicis pinguibus et columbarum ſtercore aliiſque medicamentis quæ a callo ſolvendo paralytica dicuntur utimur. Inſuper per manus frictione et confractione hunc diſſolvemus. Quod ſi lapidoſus evaſerit, ſcalpello ſuperficie diviſa exciſoriis ſcalpris conſortium oſſe liberabimus,. deinde fracturæ medebimur, ut ſuperius a me dictum eſt.—Pauli ab Æginета, lib. vi.

age have ſurgeons forſaken this operation. Fabricius has recommended the breaking the limb anew, and La Motte almoſt in our own times has practiſed it. Fabricius ſays, " when the limb is lame, the patient young, the callus recent, the bone ſoft, there is but one reſource, and that is to break the bone; but firſt try, for ſome days previous to this attempt, to ſoften the callus with embrocations of althea, mallows, and the medicated clays of St. Peter and St. Bartholomew, and then break the bone with your hands; but if theſe will not do, the callus being hard, then break it with inſtruments and heal it after the manner I have taught you *."

And in the next ſucceeding age, we find Heiſter not at all leſs explicit than Albucaſis, Fabricius, or the ancients. He repeats verbatim the rules of Fabricius. He ſays, " if a fractured limb appear crooked and deformed after the cure, I know of no other probable method of reſtoring it to its former ſhape and beauty, than by making a ſtrong extenſion of it and breaking it in the part where it is juſt united. This, however, is not to be done in the aged nor infirm, but where the callus is tender, and the patient young and vigorous, this operation may be fairly attempted †."

Nor was this merely a ſcheme with which ſpeculative men only were delighted, it was a proper rule of practice, and they never omitted any reaſonable opportunity of putting it in force. It was, I perceive at one period, ſo common an operation, that it looks indeed as if they had broken legs out of mere caprice. Here I cannot help remarking, that wherever there exiſted hot wars betwixt the bone-ſetters and the regular ſurgeons, this practice prevailed in a particular manner. The ſurgeons, by laying a leg acroſs a ſtool or acroſs the knee, and breaking it, taught the country people what ſort of puniſhment awaited thoſe who ventured to put themſelves into the hands of profeſſed bone-ſetters; and one example of this kind now and then ſerved to keep a whole province in awe, and ſuppreſſed all petty treaſons againſt the regular profeſſors of ſurgery. But the bone-ſetters were not a ſort of people to be eaſily outdone in this way. If the ſurgeon broke

* Ut ſi æger ſit juvenis et robuſtus, callus recens, os fractum exiguum, unicum erit refugium fracturam de novo rumpere, ubi tamen prius per multos dies quantum fieri poteſt callum mollire debemus, perfuſionibus ex althea et malvis ſalis thermalibus, D. Petri et D. Barthalomæi, &c. deinde rurſus os frangitur *manibuſve* digitis impelendo, fue comprimendo. Si callus fuerit durior, *fraugo* eum inſtrumento attrahente in diverſos partes, deinde ſano ut hactenus docui.—FABRICIUS.

† Page 117.

legs of their ſetting when they looked clumſy, they knew in revenge how to bandage up legs with ſplints and rollers which were never broken, and ſo by ſetting their patients a-walking in a fortnight, they quite ſhamed the ſurgeons, who, when they reduced a leg, could not make their patient walk in leſs than two months * ".

Men of the firſt eminence in our profeſſion, the very beſt ſurgeons in the world have been in the practice of performing this operation. I was called, ſays La Motte †, to a young man of ſixteen years of age who had the thigh bone broken ſeven or eight weeks before, and it was ſo re-united that he could not walk ; the broken thigh bone was ſhorter by half a foot than the ſound one, and he called me in order to learn whether ſome ſort of ſhoe might not be invented by which the leg might be raiſed ſo as to enable him to walk.

I found the bone broken about the middle of the thigh, the bones were ſo awkwardly joined that they abſolutely croſſed each other. There was a great elbow looking outwards, and a proportioned hollow within ; but the lad being young and healthy, and the callus as yet ſoft, I formed the reſolution of ſetting the thigh bone again in its right ſhape by extenſion and counter-extenſion ; for I knew that the attempt could do the boy no harm, and I remembered from the accidental breaking of the callus, that the callus was long of obtaining its perfect conſiſtence. So having made his bed and prepared bandages and ſplints, I made a powerful extenſion by the help of my young men, and puſhed in this elbow with the flat palm of one hand, and reſiſted with the other. I ſucceeded perfectly to my mind, ſo that, without one cry from the lad, I reduced this angle, and made his fractured thigh as ſtraight and as long as the other. In a month he was freed from his ſplints, and walked without pain or halting, while his thigh was as ſtraight as an arrow ‡.

There is a rudeneſs and boldneſs in theſe old practices which we dare not imitate ; yet theſe are facts of which no ſurgeon ſhould be ignorant, and indeed it is a matter which ſhould be ſeriouſly conſidered, whether an oblique fracture will not

* Bone-ſetters and rib-twiſters have been long a great nuiſance in France, Germany, and Holland. Fellows who, every time a country man gets a bruiſe in his ſide, tell him his ribs are broken, and then pretend to thumb them into a right ſhape, or when he ſprains his leg, bandage it up, and find means to convince him that it is fractured, and that the cure, and eſpecially the perfect ſhape of the limb, is their own work.

† Page 193. ‡ Page 196.

be more eaſily retained of its due length, after the bones are rounded with a callus, and the ſurrounding parts all maſſed together, and ſo knotted by inflammation, as to ſupport the edge of the bone, than when the fracture is recent, the broken ends of the bone naked and very ſharp and pointed, cutting their way forwards among the lacerated fleſh. It is to be conſidered whether La Motte did not accompliſh, in this latter ſtage of the callus, what he could not have atchieved in the recent fracture. Does not his report alſo give us a ſort of aſſurance that the pain will be leſs even if we ſhould venture to diſunite an incipient callus, than when we extend a leg recently fractured and highly inflamed?

I know how ſtrong the common prejudice is, and that theſe will hardly be received as concluſive proofs of callus being little injured by occaſional motion. Notwithſtanding the clear hiſtory of theſe facts which I have juſt delivered, it may be alleged, "that the wild and ignorant notions of Albucaſis, or the learned and Gothic credulity of Fabricius, or even the rude and bold enterpriſes of La Motte and his contemporaries, are all but ſlender arguments for ſupporting a new doctrine." But the doctrine ſtands not upon any ambiguous proofs. I could demonſtrate to you, if it were worth your knowing, that every ſurgeon, from the days of *Celſus* downwards, had been in the practice of extending the leg, and ſo extending the callus and putting it right when at any time he thought it wrong. This unqueſtionably is true, that if a man will not ſuffer his limb to be at reſt; if, like the ſtreet porter mentioned by Palfin, he will not refrain from carrying burdens though his arm be broken; or, like the ſhoemaker whom I have mentioned, will not leave off working at his trade, though the radius and ulna be fractured! there is no queſtion, that ſuch inceſſant and violent motion will deſtroy, from time to time, all continuity of veſſels, and abſolutely prevent the formation of a callus. But there is nothing more certain, than that the extending a callus gradually, regularly, and gently, from time to time, will not harm it.

In the fracture of the thigh, where the muſcles are powerful, and where all the ingenuity of the profeſſion has never yet been able to prevent retraction and ſhortening of the limb, while ſome have put garters round the ancle and tied them to the foot of the bed to maintain a permanent extenſion, others have choſen to allow of that occaſional contraction which they were ſenſible they could not entirely prevent, being careful only to renew the extenſion from time to time; and if thoſe who judged in this manner had the boldneſs to extend the limb

anew every day, or at every dreſſing, or every twelve hours, then we may be aſſured of one of two things, either that ſuch extenſion does not injure thoſe veſſels which are gradually forming and perfecting the callus, or that a leg ſo maltreated could never reunite.

Mr. Foubert of the Royal Academy of Surgeons of France, laments the impoſſibility of keeping up any permanent extenſion on account of the excoriation, ſwelling, and intolerable pain which ſuch bandages excite. He was ſenſible that he could not prevent the limb contracting, but he was careful to extend it from time to time. He laid his patient upon a hard and firm made bed; he put a napkin, or other bandage, under the pelvis and round the groin, by which an aſſiſtant made reſiſtance (or counter-extenſion, as it is called in technical language), while he himſelf extended the leg by a lack or bandage put round the ancle joint. The moment the limb was extended, the patient was relieved; but the relief laſting but for an hour, the limb contracted and required to be extended again; and Mr. Foubert *renewed this extenſion every twelve hours*, if neceſſary, for the firſt twenty days; but after the twelfth, fifteenth, or twentieth day, the callus becoming firmer, he found no longer any occaſion for extending the limb *."

Parée, more rational and moderate in his manner of extending the leg, adviſes the ſurgeon to be careful at each dreſſing, that is, every third or fourth day, to compare the length of the broken limb with that of the ſound one, and to be careful in extending and reducing the limb before the callus fixes, leſt the patient ſhould halt when cured †. I think there is even reaſon to believe, 1ſt, That in caſes of deſperate and oblique fractures, thoſe limbs have been leaſt deformed which have been moſt frequently broken. 2d, That a limb ill ſet, fractured again by chance while the callus was ſoft, and ſet a ſecond time, has been preſerved more nearly of its due length than it could have been if ſet immediately after the accident, and allowed to heal without interruption. 3d, There is alſo reaſon to believe, that thoſe ſurgeons who have uſed the permanent extenſion with moſt ſucceſs, thoſe I mean who have kept the leg continually extended by bandages fixed to the head and to the

* On eſt quelquefois obligé d'avoir recours au même procédé toutes les douzes heures, pendant les premiers jours du traitement; mais paſſé douze, quinze ou vingt jours on n'eſt plus *auſſi ſouvent* dans cette néceſſité.—FOUBERT, p. 645.

† Partant, faut à chaque fois qu'on l'habille avoir égard à la figure de l'os et conferer la longueur de la jambe ſaine à celle du côté malade et auparavant que le callus ſoit fait le tirer et reduire, en ſort que le malade ne demeure boiteux, et que le malade ſe remue auſſi le moins qu'il pourra.

footboard of the bed, have ſucceeded, not as they imagined by ſupporting an unceaſing tenſion of the leg to the ſame exact length for ſix weeks or two months! that were impoſſible! It ſeems to me more likely that the lacks and bandages have relaxed from time to time, that the joints of the limb itſelf have yielded, that by this yielding the apparatus has been looſened, and the patient has lain more eaſy during the night, that the ſurgeon in the morning has extended the limb again, and regained by this new tenſion what had been loſt during the afternoon and during ſleep; and thus what authors have called a permament extenſion, ſeems to me rather to conſiſt in ſucceſſive reductions of the limb like thoſe of Mr. Foubert. I believe, therefore, that Mr. Foubert, who rejected theſe extending bandages as a uſeleſs cruelty, obtained exactly the ſame advantages by occaſionally extending the leg, that thoſe have done who have pretended to ſupport a permanent extenſion. I am confirmed in this opinion by remarking that Heiſter, who uſed the bandages fixed to the head and foot of the bed, did not ſo much regard thoſe bandages as means of permanent extenſion! He conſidered them rather as lacks fixed for the purpoſe of occaſional extenſion, and therefore he directs the limb "to be extended anew every time it contracts during the cure."

Thoſe who, in conſequence of accidents, have had their limbs ſet again from time to time (the bones having ſlipped paſt each other), have had the limb ſtraighter and longer than thoſe who have had the limb ſet once for all, and not unbandaged till near the end of the cure. Thoſe limbs alſo have been leaſt ſhortened which have been ſet, and diſturbed and ſet again. Thus Paræus, who did not believe that there was really ſuch an accident as a fracture of the neck of the thigh bone, being called to an old lady who had, by a fall, injured the haunch joint, found what he imagined to be a luxation. It was the ſhortening of the leg that made him imagine that the hip was luxated, and when he felt the great trochanter high upon the hip, he imagined that to be the head of the bone. He extended the limb till he thought he had puſhed the head of the bone into its ſocket, and brought the two legs to be of equal length, and then applied his ſpica bandage. But two days after, upon viſiting the lady, he found her complaining of great pain, and her leg was ſhortened again, and it was then only that the limb was properly ſet. This leg reduced at the diſtance of ſome days from the accident, and extended from time to time was cured without ſhortening.

Hildanus too, having ſet the thigh bone of a little girl of eight years of age,

the thigh contracted again on the fourteenth day, the bones paſſed each other, and the thigh was ſhortened, yet this is the caſe in which Hildanus ſucceeded the beſt! He made a perfect cure; and indeed upon mentioning the cure, he breaks into ſolemn exclamations of thankſgiving, with many expreſſions of gratitude to him that made us, which, even amidſt his antique language, muſt, to a modern ſurgeon, ſeem particularly antiquated *.

I hope that by theſe facts and reaſonings I have ſufficiently proved to you, not only that callus is not a chemical proceſs, an inorganic concrete, which being diſturbed in its time of concretion will never form, but alſo that callus conſidered as the rudiments of new bone, though delicate, is flexible, and though it may be hurt by rudeneſs, cannot be deſtroyed! That when the cure is interrupted, even by an entire fracture of the callus, the proceſs is eaſily renewed! that it is not every ſlight diſturbance that will diſappoint us of a cure; that thoſe accidental movements of a broken limb which alarm the patient, or even give him pain, and which he reports with great earneſtneſs and anxiety to his ſurgeon, are yet of no importance. You perceive with how little reaſon the juſtly celebrated Deſſault ſays, "That it is a principle *which will admit of no controverſy;* that to effect the re-union of fractured bone nature requires, not merely that the fractured ends be approximated, but that the limb be *preſerved in a ſtate of abſolute reſt.*" This incontrovertible principle he makes the rule of all his practice, may I be allowed to ſay it, of all his cruelties; for this he derides, (and forbids in the moſt abſolute terms), the practice of laying out a limb eaſily upon a pillow. It is about the practice rather than the theory that I am apt to be concerned, and I doubt not you will be able to forſake the authority of a great name, whereever you feel yourſelves ſupported by the paramount authority of reaſon and facts.

But what need is there of ſuch proofs, have not ſurgeons continued bandaging fractured legs with rollers, down to this very day; and does not the ſurgeon every time that he rolls the limb, which is, by all the rules of ſurgery, every third day,

* Hildanus remarks one thing very ſingular, very conſiſtent with all the doctrines which I have delivered, and which I would be ſorry to paſs over in ſilence. He obſerves, "that though the thigh was greatly and ſuddenly ſhortened, fully three inches, and with a great protuberance, yet it was accompanied with no degree of pain; ſuch as might be expected from the exquiſite ſenſibility of the perioſteum. Extuberantia tamen hæc ſine dolore ullo fiebat qua de re forſan admirari poteris cum perioſteum exquiſitiſſimo ſenſu ſit preditum et proinde dolores graviſſimos excitet ſi ab oſſibus fractis pungatur.—HILD. Obſ. 86.

does he not move the callus? he would be a cunning ſurgeon indeed who could cure a broken limb by rollers and ſplints, if a ſlight motion could diſcompoſe the callus. If then the old doctrine of callus, being eaſily diſcompoſed, be ſo plainly a miſtake, what can be more abſurd than the old practice? While the re-union of veſſels and generation of callus in a broken bone, is ſo fairly analogus to the inoſculation of veſſels and the re-union of ſurfaces in an open wound, nothing will injure callus which will not hinder any other adheſion. Motion will not ſo eaſily affect an incipient callus, (ſurrounded as it is with adhering parts), as the adheſion of a ſuperficial wound, which has nothing but ſtitches or plaſters to ſupport the parts. Callus is not a juice! it is not an effuſion from the ends of the broken bones! Callus has no analogy with molten lead! nor the ſetting of gypſum! nor the hardening of ſtalactites, nor any other concretion! could motion diſcompoſe callus, as it prevents other concretions from hardening, no broken bone could ever heal.

From this hiſtory, you obſerve I draw no raſh concluſions. I do not propoſe to break limbs when they are almoſt healed, that they may heal faſter; nor to take even a crooked and unſerviceable limb and lay it acroſs the knee like La Motte; but I do with perfect confidence adviſe you, to leave off bandages, which you ſee were originally deſigned for no other uſe than to mould and faſhion the callus; to reject thoſe long compreſſes which were bound ſo firmly round the limb for the ſame purpoſe; to uſe ſuch ſplints only, as when laid along the whole limb, may ſerve to maintain its poſture and preſerve it ſteady, and to tie thoſe ſplints ſlightly with tapes; to lay out a broken thigh, (ſince it cannot be commanded by ſplints), ſmoothly upon a pillow, and to venture, without fear of hurting the callus, to extend the limb anew, and lay it ſtraight when it is diſordered and ſhortened. In a ſimple fracture of the leg, it is almoſt ſufficient to lay it on a pillow; and you have done every thing when you have laid it lightly and eaſily in a ſmooth ſplint of paſteboard, then the patient himſelf is almoſt able to keep it right. In fractures of the arm, the part hangs naturally in the beſt poſture, and requires but two ſplints of thin paſteboard, rolled gently with a linen roller; and in fractures of the fore-arm alſo, the limb preſerves its natural length and natural form; it requires merely to be laid upn a long ſplint of paſteboard with a ſmaller ſplint laid above, the two ſplints ſecured with ſlight tapes or ribbons, and the arm ſlung round the neck.

Diſmiſs, then, thoſe anxieties about the manner of rolling, and the expreſs de-

gree of firmneſs which the bandages ſhould have, look no longer thus anxiouſly at the points of the fingers or toes, to ſee whether the bandage preſſes properly ſo as to make thoſe parts ſwell; you are not to draw the roller ſo as to ſtraiten the limb up to the very point of producing gangrene, nor to uſe any bandages that are formidable from their ſtraitneſs, nor any that are even firm, except in children, in drunken people, in maniacs, or in thoſe who are delirious with fever or pain.

### DEFINITIONS OF THE VARIOUS SPECIES OF FRACTURES.

Having corrected ſome prejudices, and initiated you into the hiſtory and theories of this intereſting ſubject, I propoſe next to lay before you the various characters and diſtinctions of fractures. The formal diſtinctions of the ſchools we muſt endeavour to unlearn; for in the old ſurgery, fractures were diſtinguiſhed rather by their form and other trivial accidents, than by the eſſential circumſtances or peculiar dangers of the caſe. The ancients diſtinguiſhed fractures into oblique, tranſverſe, and longitudinal, according to the direction in which the bone chanced to be broken. They called a fracture Incomplete, when, of two bones, as the Radius and Ulna, one only was broken; Complete, as when both bones were broken, both Radius and Ulna, or Tibia and Fibula, or where there being but one bone, as in the arm or thigh, that bone was broken. They called a fracture Simple where there was no wound of the ſkin, and apparently no ſplinters of bone, and they called it Comminuted Fracture, when, though the ſkin was ſtill entire, it could be perceived by handling the member that the bone was broken, or as they choſe to ſpeak, comminuted, cruſhed into ſmall pieces. This was what Duverney called compound fracture. But I would allow of no diſtinctions ſo trivial, ſo perplexing, ſavouring ſo much more of learning than of knowledge. I would have uſeful, practical diſtinctions, or none. Theſe diſtinctions of the old ſurgeons were made at a period when men delighted in no other kind of learning; they have no relation to the treatment of any caſe, and ſhould not occupy a mind, which ſhould be filled with more important conſiderations; for there are certain peculiarities in each caſe which determine the ſafety or danger of the patient, and even the peculiar treatment, and theſe are, doubtleſs, the circumſtances you ſhould learn to dwell upon.

Firſt, *Simple fracture* is that in which the bones, though broken, do not protrude. The ſoft parts, though inwardly torn, are but little injured. The perioſteum is not

ſeparated in any remarkable degree from the bone; but the perioſteum clings to the bone, the tendons and muſcles to the perioſteum, and the ſurrounding ſoft parts are ſo compreſſed around the fracture, in conſequence of the limb being entire, that adheſion ſoon takes place among them! The interſtices are filled with a gelatinous effuſion which ſoon becomes organic, and the continuity of veſſels is immediately reſtored. Even in a comminuted fracture, each little piece of bone retains its connexion with the ſoft parts, and lives, and is nouriſhed, and reunited with the bone to which it belongs, ſo that when we diſſect a fractured bone in the firſt days, we find the perioſteum thickened like ſoaked ſhammoy leather, the ſoft parts maſſed together by inflammation, and the ſecretion of bone beginning in ſeparate points; and when we diſſect an old fracture, we find little pieces and ſplinters perfectly conſolidated into the callus which had been entirely ſeparated from the bone. This caſe, then, requires nothing but eaſe and quiet, and a favourable poſture of the part. The cure may be reſembled to the adheſion of an open wound where there is immediate reunion of veſſels, no ſuppuration, no waſte of parts, no remaining mark of injury, there is a ſpontaneous and perfect cure. The cure is ſpontaneous, the work of nature alone! the ſurgeon has nothing to care for but the form of the limb, to lay it even at firſt and to redreſs its poſture when it happens to be diſordered.

Secondly, *Compound fracture* is that where the fracture is accompanied with an outward wound, and it is called Great Compound Fracture when the bone protrudes. And in this caſe the fleſh is often cruelly mangled, and the bone ſhattered into many pieces, and yet the parts retain (though not always) their life and vigour. The protruſion of the bone makes a rude and lacerated cut; the ſoft parts, as the perioſteum, muſcles, and ſkin, are all cruelly mangled, but they are not deſtroyed; the perioſteum ſtill clings to the bone, the muſcles to the perioſteum, and the ſkin to the muſcles; there is a very ſhocking outward injury, but there is happily no proportionate diſorder of the inward parts. The inward parts are lacerated and wounded by the protruding bone; they are hurt by the violence (as the cruſhing of a chariot wheel) which cauſed that protruſion; but they are ſtill alive, ſtill adhere to each other, and give mutual ſupport; no part is ſo entirely killed, as by its death to draw on the death of the whole. But then theſe parts, though not killed nor ſeparated from each other, are ſo torn that they ſeldom reunite; they run into inflammation, and the cellular ſubſtance is ſo filled

with extravaſated fluids, and the bones ſo cruſhed, and reunite with ſo much difficulty, that the ſuppuration is very profuſe.

The caſe, then, which is here defined, is a compound of fracture with a great ſuppurating wound not void of danger. The gorged veſſels are ſoon unloaded by a free and timely ſuppuration; after the firſt ſwelling ſubſides, the parts become flaccid, the matter profuſe, the patient is in danger of being exhauſted with pain and fever, and the dangers of the caſe are chiefly thoſe of a great ſuppurating wound! If we are forced at any time to amputate ſuch a limb, it is only for want of ſtrength in the patient to ſupport the pain, fever, and profuſe diſcharge; for through time and care the lax ſwelling ſubſides; the ſuppuration leſſens in quantity; the looſe bones are diſcharged; the living bones (whoſe perioſteum ſtill adheres to them), though broken in a way ſeemingly deſtructive of all organization, recover their connexion with the fractured bone, in a manner which has long been admired. Of the bruiſed parts, thoſe which lie deep come to be preſſed into contact with each other; the vacant ſpaces within and the external wound are filled with granulations, and then the continuity of veſſels is reſtored, and the callus is completed. This continuity of the veſſels is eſſential to the regeneration of the bone; and we ſee the reaſon of a phenomenon which has excited the ſurpriſe, not only of Dr. Hunter, but of all ſurgical writers from time immemorial, viz. that during the ſuppuration, and while the wound continues open, no callus, or at leaſt, no complete callus, ever forms.

Thirdly, In COMPOUND FRACTURE AND LUXATION where, along with the protruſion of the bones, there is a laceration of ligaments, tendons, and capſule of ſome great joint, the caſe is peculiarly dangerous. When, for example, the ancle joint is burſt up, the aſtragalus broken to pieces, or turned out through the wound, the lower end of the tibia ſhattered and protruded, and the fibula alſo broken, the diſorder is ſuch as to defy the powers of nature, and art can do but little. This is of all caſes the moſt perplexing to the judgment, and diſtreſſing to the feelings of the ſurgeon, who often wavers in fear and anxiety, for ſome days deſirous of ſaving the limb, and yet fearful of loſing the patient's life, till at laſt the fatal gangrene appears, and he feels moſt poignantly the fault he has committed, if, indeed, the ſurgeon can be ſaid to have committed a fault who has attempted to ſave a man's limb, though at the riſk of his life. Yet the ſurgeon, though he have acted deliberately, conſcientiouſly, ſenſibly and humanely; though

he has been ſupported by the countenance of his fellow ſurgeons; ſtill, when misfortune comes, muſt feel himſelf unhappy.

The French ſurgeons, with one accord, declared amputation to be in ſuch caſes the only chance of ſaving the life. Palfin ſays *, "In luxations of the ancle, there is ſeldom any thing to be done but amputation." The ſame is laid down by Duverney †, as an expreſs unconditional rule of practice. We do not comply with any ſuch barbarous rule, we take it only as a denunciation of the danger which is obſerved to attend this particular caſe; we keep our minds free and unbiaſſed, ſo that we may be able to decide this queſtion according to the circumſtances. We know that nature will do wonders, but they are wonders, and we never enter upon the attempt of preſerving a limb thus deſperately fractured, without awful heſitation, and when we do venture to dilate the wound and puſh back the bones, we feel all the reſponſibility of what we have juſt done. We watch the appearance of mortification for ſome days, and wait with inexpreſſible anxiety the natural iſſue of the caſe, life or death.

Thus the ſimple fracture terminates in adheſion of the parts inwardly bruiſed and injured; compound fracture ends ſometimes in adheſion, but more frequently in ſuppuration of parts too much bruiſed to adhere; but the fracture of a great joint, as of the ancle, is attended with lacerations too terrible to adhere, or even to ſuppurate eaſily; this is the caſe which while it ſometimes ſuppurates is moſt apt to terminate in gangrene and death.

Fourthly, *Gun-ſhot fracture* has many dangers peculiar to itſelf; and of all thoſe circumſtances by which, in other fractures, the ſoft parts recover their healthy condition, and the ſplinters regain their natural connexion with the bone, not one can take place in gun-ſhot wound: For here there is infinite loſs of ſubſtance! the bone is not merely broken, it is deſtroyed, contuſed, and deadened by the blow, and condemned to the abſolute exfoliation of every individual particle and ſplinter that has been ſhaken by the ball.

From the moment in which the bone is ſtruck by a ball, it loſes its life and circulation, and all its connexions with the ſoft parts. The bone is deadened to ſome extent by the force of the blow; it is ſplintered into many pieces; the perioſteum too is killed by the ſhot, ſo that of the injured or ſplintered pieces, not one can recover its life or reſume its connexion with the living ſyſtem.

Nor is the bone only killed, but all the ſurrounding parts alſo, for the bone is

* Page 184.

† Page 157.

the reſiſting body which, by receiving the force of the ball, reverberates it upon the adjacent parts, ſo that that portion of the fleſh which moſt immediately ſurrounds the bone, is particularly affected, is deadened, and thrown out in the form of ſloughs.

Theſe are the accidents of this ſpecies of fracture which diſtinguiſh it from all others; for the death of all the internal parts inſulates the broken bone. There can be no adheſion among parts which are actually dead, the continuity of contuſed veſſels can in no ſhape be reſtored; inſtead of a knotting of the ſoft parts into a vaſcular maſs, full of life and action, ſupported by a continuity of veſſels, and fitted for the generation of callus! there is a cavity full of fœtid matter, dead and ſloughing fleſh, and inſulated fragments of bone! a narrow opening, a deep and ill-conditioned wound, and a profuſion of foul and putrid ichor flowing from the narrow openings, or burſting through various fiſtulas from time to time.

Thus, a gun-ſhot wound with a great fracture, reſembles in many points the worſt kind of caries. The detached bones are diſcharged with difficulty; the dead parts which have ſloughed off, are very ſlowly replaced; it is long before the wound begins to heal from the bottom, or, in other terms, before the continuity of veſſels is reſtored, or the maſs of vaſcular ſubſtance prepared, in which the callus is to be formed. In ſhort, the parts are with difficulty regenerated; they are ſlow to heal; apt to run into ulcers, fiſtulas, and collections of matter; while the patient is exhauſted by pain, fever, and profuſe diſcharge.

Having thus explained to you the general nature of a gun-ſhot fracture, I believe you can be at no loſs to imagine the peculiar difficulties of each caſe, for where the limb that is wounded is ſmall, there is leſs deſtruction of parts; the ſloughing is not great, the ſuppuration is ſlight, and the bones being near the ſurface, the ſhattered fragments are eaſily diſcharged. Thus it is in wounds of the radius and ulna, and of the os humeri.

But where the bone is greater, the maſs of ſoft parts more bulky, the wound of courſe deep, and the deſtruction of parts proportionably great, the matter is apt to inſinuate itſelf among the muſcles, to inſulate the bones, and to make in the end crooked and fiſtulous paſſages, and an almoſt incurable ſore. Such are often the conſequences when the bones of the leg are broken, eſpecially where the joints of the ancle or knee are concerned.

But where the bone is the largeſt in the body, and covered with a great thick-

neſs of fleſh, as in the thigh, there is a very extenſive deſtruction of parts, the maſs of diſeaſe is very great, and if the patient eſcape gangrene in the firſt days of the wound, he generally periſhes afterwards from the fever, the inceſſant ſuffering, and profuſe diſcharge. From a gun-ſhot wound in the haunch bone, or in the femur, near its neck, about the trochanters, or any where high in the bone, not one of twenty eſcapes. The ſufferings of ſuch a perſon may be eaſily imagined, ſince he lives, or rather one might ſay, continues dying for five years, and while he lies on this bed of torture, with matter running in profuſion from various fiſtulas every where ſurrounding the joint! irregular callus ſhoots out in fantaſtic forms round the bone, ſo as to unite the bones in that crooked form in which he lies; yet even while the callus is thus forming, the fiſtulas being incurable, and the diſcharge profuſe, amputation is impoſſible, and the patient expires.

# DISCOURSE XIII.

## ON THE ANATOMY AND ACCIDENTS OF THE HIP JOINT.

" IN MIRABILI ARTICULATIONE FEMORIS CREATOREM ADORAMUS."

BOERHAAVE.

It is not alone on account of the lameneſs and miſery which ſo often follow injuries of the hip, that we take a lively intereſt in the ſubject. There are difficulties in diſtinguiſhing the various affections of this deep lying joint degrading to ſurgery; every individual feels at times as if he were alone reſponſible for the general ignorance, and accountable for that lameneſs which is declared to be inevitable. They are difficulties which all ranks of our profeſſion complain of, which I cannot but feel, yet it is the ſubject which I muſt now endeavour to explain.

To what cauſe ſhall we aſcribe this uncertainty? ſurely to careleſs ſtudies and indifference, to anatomy, to ignorance of the form, or, at leaſt, to an imperfect conception of the nature of the joint. Many have been made unhappy for life by this prepoſſeſſion, as criminal almoſt as it is ignorant; " that to diſtinguiſh the diſorders of this joint is impoſſible, that to feel for its injuries is an unmeaning cruelty; in one word, that lameneſs is inevitable!" Formal ſcholaſtic unmeaning diſtinctions have been long repeated as ſubſtantial knowledge; and explanations, which have no relation to the ſtructure of the joint itſelf, praiſed as important theories. The joint has been deſcribed as compoſed merely of bones, and well are they who underſtand even the bones! but to conſider it as a compound articulation, to regard the bones as endowed with living powers, as parts formed and ſupported by veſſels, growing along with the body, and, like the reſt of the body, ſubject to decay and injury! to obſerve the ſoft and glandular parts which facilitate the motions of the joint, and to regard the whole, the bones, perioſteum, ligaments, and glands, as alive, ſubject to the uſual changes of the living body, and to all the varieties of diſeaſe! is a flight beyond the uſual education in

philoſophy of young men who learn merely the form of the naked ſhaft and proceſſes of the bone, and know nothing of the living properties of the bone, of that ſyſtem of active veſſels within itſelf, or of vaſcular connexion with the ſurrounding parts, which can alone explain the nature of its diſeaſes.

There are no doubt caſes in which the errors of the ſurgeon are more immediately fatal than in the injuries of the hip joint, but in none do his miſtakes render the patient ſo truly unhappy. If a bruiſe of this joint be neglected, if a luxation be miſunderſtood, the patient becomes irrecoverably lame, and every day of his life he is reminded of his misfortune by pain and fatigue. We obſerve numbers in the ſtreet whom we pity, even from the apprehenſion of what they ſuffer; perhaps many of thoſe might have been ſaved from this mortifying and miſerable ſituation; ſurely the frequency of this kind of lameneſs ſhould be alarming to every ſurgeon.

If there be any ſubject univerſally acknowledged to be at once intereſting and difficult, or upon which we ſhould naturally enter with an impreſſion of its importance, it is this; the natural connexions of anatomy and pathology, of cauſe and effect, will, I believe, appear more and more obvious and important as we proceed in the inquiry, yet it is a ſubject which ſhould be opened with the moſt perfect ſimplicity, and on this account I beſpeak your attention to the following deſcription of the hip joint. The ſtudent may be inſenſible to the value of this leſſon, but the eſtabliſhed ſurgeon ſoon begins to count his years by his diſappointments, and thoſe who have had the moſt experience, will be the moſt ready to acknowledge, how frequently, and how unhappily they have ſtruggled againſt thoſe very difficulties which are the chief ſubject of this diſcourſe.

## GENERAL ANATOMY OF THE HIP JOINT.

The hip joint has to bear the whole weight of the body, and of occaſional loads, nor is there any joint in all the body (not even the vertebræ of the neck, nor the hinge of the knee itſelf excepted), which has a more continual motion. There is no turn of the limbs nor inclination of the body which does not produce a correſponding motion in this joint. When the body being erect, we bend the trunk, there ſeems to be a motion in the vertebræ, while it is merely the pelvis rolling upon the top of the thigh bone. When we turn the toe, even in the ſlighteſt degree

inwards or outwards, though there ſeems to be a motion in the foot, there is actually none; the ancle and knee are rigid, and the correſponding movement is at the top of the thigh. Even when we lie along in bed, there is no movement of the limb, no inclination nor change of poſture in the body, however ſlight, which does not affect this joint; thoſe who have the hip joint injured lie as ſtill as in the grave: In ſhort, the ſlighteſt motion of any part of the body moves this central articulation, and produces the moſt horrid pain; the pelvis, in the ordinary motions of walking, rolls continually upon the top of the thigh bone; and thoſe who have the thigh bone diſplaced from its ſocket, in whom the weight of the body is not ſupported by the bone, but hangs by the ſoft parts, feel how entirely this joint ſupports the weight of the trunk, and is, as it were, the centre of all its motions. The knee does, indeed, like the hip joint, ſupport the whole weight of the body, and equals it in ſtrength and firmneſs; the knee is alſo ſecured by ſtrong internal ligaments, and is lubricated with many mucous ducts, but it has only one motion to perform; it is a mere hinge; it bends, but does not turn. In ſhort, no joint of the body is at once ſo large, ſo firm, ſo ſteady, and yet ſo free in its motions, as that of the hip; the knee and ancle joints ſupport the whole weight of the body, but they are merely hinge joints, moving only backwards and forwards; the hip joint alone, while it bears the whole weight of the body, moves, at the ſame time, in all poſſible directions; and yet its movements, though continual, are ſo eaſily performed, that we are inſenſible of them till the joint is inflamed, when every motion gives excruciating pain! or till it is anchyloſed when not only the limb is diſtorted, but the whole perſon deformed!

In the ſhoulder, the glenoid cavity or ſocket for the bone is ſhallow, the head of the bone is flat, there is no neck joining the head to the ſhaft of the bone; and the capſule of the joint is extremely thin; it merely contains the lubricating liquor, but adds nothing to the ſtrength of the joint. In the knee the heads of the bones are abſolutely flat, and are merely laid upon each other; there is no ſocket for receiving a round head, nor head to be ſo received; the capſule of the joint is tranſparent at the ſides of the patella, and as delicate in all its circle as a common burſa mucoſa; while the internal ligaments are placed not in the centre of the joint, but at the back of it, for it is merely a hinge, whoſe internal ligaments regulate only its flexion and extenſion. But in the hip joint, all the proviſions for firm, ſteady, and, at the ſame time, eaſy motion, are very perfect; thus,

1. The ACETABULUM or ſocket for the thigh bone is deep, large, circular, very

ſolid, hollowed out of the largeſt bone of the pelvis, which is of courſe the largeſt and ſteadieſt bone of the trunk; while the head of the thigh bone is very big, of a regularly ſpherical form, and is inſerted deep into this ſocket, the whole head of the bone being covered by the cartilaginous borders of the acetabulum.

2. The thigh bone is the only bone in the body which has properly a NECK, which is long and oblique, and ſets off the ſhaft of the bone from the ſocket, ſo that the high ſhoulders of the thigh bone do not, even in its wideſt motions, encounter the back of the haunch bone. The ſhoulders or proceſſes of the thigh bone, named TROCHANTERS, are very large, to receive many powerful muſcles which are implanted into them for the purpoſe of managing and turning the limb; and theſe rotatory muſcles turn the thigh bone upon its axis, preparing the limb for every new ſtep, ſteadying it when the ſtep is made, or bending and inclining the trunk upon the top of the thigh bone, when the limb is fixed by the weight of the body.

3. The CAPSULE of this joint is ſingularly firm, it does not merely contain the ſynovia, but gives ſtrength to the joint: while other capſules are as thin as air-bubbles, this is in ſome parts nearly half an inch in thickneſs, hard and firm, it is, indeed, at its fore part almoſt cartilaginous! and it needs to be thus firm, for the long neck of the thigh bone prevents the great muſcles being implanted (as in the os humeri) cloſe upon the head of the bone, ſo as to ſupport the capſule.

4. The CENTRAL LIGAMENT is truly in the centre of this joint; it ariſes from the bottom of the ſocket, and is implanted into the very centre of the head of the thigh bone; it is ſtrong and firm, and holds the bone firm in its place; for this is a joint which moves freely, all its motions are rotatory, and this ligament is in the very centre of its circular motions.

5. The MUCOUS FIMBRIÆ, which lubricate the bones to facilitate their motions, lurk in the centre, or rather in the loweſt part in the bottom of the ſocket; they are naturally connected with the central ligament, they are grouped round the root of it, and of courſe are moved with every motion of the joint, giving out their mucus in proportion to the degree of motion.

### OF THE ACETABULUM OR SOCKET.

The acetabulum or ſocket for the thigh bone is formed in the centre of the greateſt and firmeſt bone of the pelvis, named os innominatum, from its irregu-

lar ſhape. It is in the adult the largeſt and firmeſt bone of the pelvis, but in the child it is formed of three diſtinct bones, the Ilium, Iſchium, and Pubis. Theſe are joined by an intermediate cartilage, and are eaſily ſeparated into diſtinct bones. At an early age this cartilage is prominent, and ſomewhat of a triangular form. The cartilage is oſſified in the adult, and it being oſſified, becomes more prominent, and makes a high triangular projection in the centre of the ſocket; this prominence gives a firmer connexion to that thin cartilage which lines in a more general manner the cavity of the ſocket; it is here alſo at this prominence in the centre of the ſocket that the central ligament is fixed, which, although it is named the round ligament, is (eſpecially at its root) of a triangular form. The bones, which compoſe the acetabulum, are not inſeparably joined even at the twentieth year; it has been affirmed, that by a violent blow on the trochanter, driving the head down into the acetabulum, thoſe three bones have been burſt aſunder! I ſtrongly ſuſpect that it is the imperfect oſſification in the centre of this joint that makes the acetabulum ſo often in boys the ſeat of diſeaſe.

The ſocket is of a fair circular or cymbal-like ſhape; from its reſemblance to a ſmall cup in which vinegar was meaſured by the ancients, it is named ACETABULUM; it is deep, and entirely receives the head of the thigh bone; its borders are cartilaginous, project beyond the bone, and deepen the cavity. Its upper part, where it is formed by the Os Ilium, is both the deepeſt and the ſtrongeſt part of the ſocket. Here the thigh bone is deeply lodged; upon this point, in the perpendicular poſture of the body, the whole weight of the body reſts and moves; and when a perſon falls from a height and lights perpendicular on the feet, the weight of the body, the impulſe of the fall, the additional weight of a burden (if the perſon is loaded), bears altogether upon the neck of the thigh bone, and it breaks acroſs.

The lower border of the acetabulum is very differently formed; at the lower part of the ſocket no weight is ſuſtained; the head of the thigh bone is very ſuperficially lodged; the ſocket is not even formed of bone, but there is a gap in this part of it filled up merely by ligament. It is neceſſary that ſo large a joint ſhould have a lubricating apparatus, it is neceſſary alſo that the lubricating fimbriæ ſhould be liberally ſupplied with blood-veſſels, and this is the opening in the ſocket at which veſſels can moſt conveniently enter free from the preſſure of the bones. For this reaſon there is an opening in the lower part of the ſocket which looks towards the Pubis and Thyroid hole; the bone is wanting

for ſome ſpace; a cartilaginous ligament ſupplies the place of bone, and the veſſels creep under the ligament into the bottom of the ſocket. It is from this neceſſary defect of the ſocket that luxation downwards, though not more frequent than luxation upwards, is produced by ſlighter cauſes.

## OF THE HEAD OF THE THIGH BONE.

The HEAD OF THE THIGH BONE is quite peculiar in its form, and is the only true example in the human body of the ball and ſocket joint; for the head of the humerus, though circular, is a ſmall ſegment of a very large circle, while that of the thigh bone is a very large ſegment of a very ſmall circle; the head of the ſhoulder bone has leſs than one third of a circle, the head of the thigh bone has more than two; in ſhort, the one has the properties of a flat ſurface, the other of a completely circular head received into a cavity proportionably deep. The head of the ſhoulder bone is merely laid flat upon its glenoid cavity, while the head of the thigh bone is entirely received within its acetabulum, ſo that the borders of the cavity touch its neck.

The NECK OF THE THIGH BONE is in all reſpects the moſt important part. The peculiar length of the neck of the thigh bone is eſſential to the free motion of the joint; it ſets off the trochanters from the ſides of the pelvis, and allows the ſhaft of the bone to turn freely. The neck of the femur is the only bone which bears its burden in an oblique and unfavourable direction, and it is placed obliquely, that each thigh bone may alternately bear its juſt ſhare of the general weight. When we ſtand up, the neck of each thigh bone bears its weight obliquely in a leſs favourable direction, but then each thigh is equally loaded. When we move, when we make a ſtep and incline the weight of the whole body upon one thigh bone, this thigh bone ſtands in a new poſture with regard to the trunk and pelvis, the head of the bone looks directly upwards, and the neck of the bone is almoſt in the direction of the ſhaft; but ſo curiouſly does the angle of the neck change with the poſture of the body, that in proportion as the weight of the body is inclined to one or other ſide, the neck of that thigh bone, which bears a greater proportion of the weight, comes more into the direction of the axis of the body. The neck of the thigh bone, while it bears its weight obliquely, is at the ſame time the ſmalleſt, the weakeſt, and in all reſpects the moſt imperfect part of the bone.

The head of the thigh bone is united with the neck by an intermediate cartilage, the head and neck are not firmly united till the twentieth year, and ſometimes in boys the head is ſeparated by violence from the neck of the bone, producing a kind of fracture, named by the French authors, *Decollément*. More frequently it happens that the fracture is in the neck itſelf, eſpecially in old people, for the neck of the thigh bone becomes thin at the approach of old age. But in the prime of life, when the thigh bone is broken with great violence, the fracture conſiſts neither in a ſeparation of the head from the neck, nor in a tranſverſe fracture of the neck itſelf, but often the very thickeſt part of the bone, the root of the trochanters is broken ſo as to make neceſſarily a very irregular and clumſy callus.

## OF THE CAPSULE.

The CAPSULE of the HIP JOINT is at once delicate and ſtrong, delicate in its internal ſurface or lamella, but very ſtrong in its external lamella. There is a reduplication of the membrane lining the ſocket, which it is of ſome importance to remark, for it appears to me that this capſule conſiſts of two lamellæ, of the membrane lining the ſocket, and of that which covers the haunch bone, both meeting at the edges of the acetabulum ſo as to unite there. Of theſe two lamellæ, the outer one is ſingularly firm, thick and hard, it proceeds from the external perioſteum, is ſtrengthened by adventitious ligaments, and eſpecially by a band of ligament which deſcends from the lower ſpinous proceſs of the Os Ilium; the tendon of the rectus femoris alſo takes its origin from the fore part of the capſule, and the capſule is at that part ſingularly thick, indeed it is hardly at any part of its circumference leſs than half an inch in thickneſs, and is of a griſtly hardneſs, ſo that it craſhes when cut with the ſciſſars or knife. The inner lamella again is quite different, it is exceedingly delicate, it lines the ſocket, and is reflected from the bottom of the ſocket over the central ligament, from which it expands again over the head of the thigh bone, covering that ſmooth cartilage with which the head of the bone is coated; it deſcends again along the neck of the thigh bone, and there this fine and delicate covering hangs ſomewhat looſer, and we obſerve a ſort of villi about the neck of the thigh bone, formed by the looſeneſs of this inner membrane. From the root of the neck it again joins the thick capſule, ſo that this delicate internal lamella is at once the lining of the

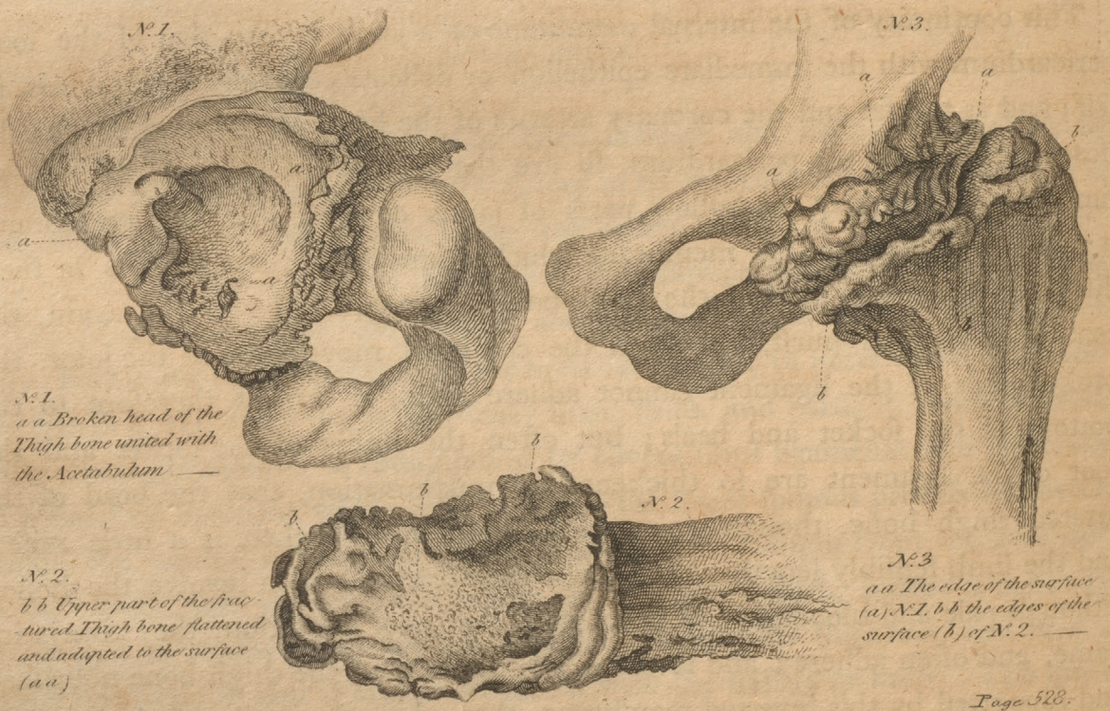
acetabulum, the covering for the head of the thigh bone, the covering alſo of the round ligament which unites the head of the thigh bone to the centre of the acetabulum, and the general lining of the capſule. This inner membrane is thin, ſoft, delicate, and at many places (eſpecially where it covers the neck of the thigh bone, and the root of the central ligament), has all the appearance of a villous coat; it is, indeed, the villous coat of the joint, it is the ſecreting ſurface; for though we conſider the fatty mucous ducts lying in the bottom of the joint as ſecreting an important part of the ſynovia, yet there is not the ſmalleſt doubt that the greater proportion of that liquor, and all that fluid which we find in dropſical joints, is merely a ſecretion from the exhalent arteries of this looſe, villous, internal lamella of the capſule.

This continuity of the internal membrane of a joint, is like that of the looſe pericardium with the immediate epithelion or delicate covering of the heart itſelf; and as the fat and the coronary arteries of the heart are covered by that delicate inflection of the pericardium, ſo are the *pellotons* of fat and the mucous fimbriæ which lurk in the hollow parts of joints covered with this membrane, it is the continuity of this membrane which connects all theſe ſurfaces in their diſeaſes. When the head of the thigh-bone is luxated and replaced again, the central ligament is burſt, but from the continual movements of the joint, the broken ends of the ligament cannot adhere again, it ſhrinks therefore to the bottom of the ſocket and heals; but often the lining of the ſocket and the root of the ligament are ſo thickened by inflammation, that the head of the luxated thigh bone, though it moves ſecurely in its ſocket, is a little raiſed, and the limb ſenſibly lengthened. Theſe membranes, which involve the bones, although pale and bloodleſs, are ſo vaſcular, that after laceration, they always inflame, and often adhere; and ſo entirely is the head of the thigh bone nouriſhed and ſupported by this inverted membrane, that when the neck of the bone is broken away, and the head left in the ſocket, the head, though apparently inſulated, and left hanging by its central ligament, lives, ſhows ſtrong oſſifying powers, and adheres perfectly to the inner ſurface of the ſocket; then the ſocket and the head of the Os Femoris become one inſeparable maſs of bone; and being thus united together, their oſſific power is ſo ſtrong, that they generate a large maſs of callus; and the upper broken end of the thigh bone reſting upon this broad maſs of oſſifying bone (compoſed partly of the acetabulum, partly of the fractured head

of the thigh bone), gives it by its preſſure a ſhape conformable to its own, and thus makes a broad but imperfect joint *.

This continuity of the nouriſhing membrane of the bones is the reaſon of their being connected in diſeaſe; and it rarely happens that the head of the thigh bone is affected with caries while the ſocket remains ſound; but wherever this ulcer begins (for it is as truly an ulcer as any open ſore in the fleſh), the diſeaſe extends itſelf from the head of the bone to the ſocket, and from the ſocket over the back of the os innominatum.

* "OS INNOMINATUM ET FEMUR SINISTRI LATERIS, UTRUMQUE POST FRACTURAM COLLI FEMORIS INSOLITO PLANE MODO DEGENERATUM." *Sandifort.*




This union of the fractured head of the thigh bone, with its inflamed acetabulum, is far from being uncommon. The above plate repreſents one from the muſeum of Leyden. The following deſcription from Ludwig, page 373, conveys the idea as fairly as ever a drawing could do. "Femur cum oſſe innominato dextri lateris ex juvene circiter octodecim annorum nunc coram intuemur, in quo criſtæ ilium et condylorum oſſis femoris epiphyſes, adhuc ſeparatæ ſunt, trochanteres autem major et minor jam prorſus coaluerunt. Epiphyſis capitis a collo ſeparata *acetabulo accrevit*, non tamen integra, ſed hinc inde carie adeſa, et ſuperficie acetabuli interna aſpera reddita; collum femoris, breve, inæquale, ita quidem in parte inferiore elevatum eſt, ut ſuperficiem, capitulo quodam modo analogam, fiſtat, cartilagine tamen non incruſtatam, ſed tantum nonnihil lævigatam."

It is this life of the bone, ſupported by the nouriſhing membranes, that approximates the diſeaſes of the bones and joints to the diſeaſes of the ſoft parts; in ulcer, for example, of the ſoft parts, while one ſurface is extenuated by ulceration, the adjacent parts are ſwelled by inflammation, or protrude in the form of fungous fleſh; in like manner, while one ſurface of a bone is waſted by caries, which is an ulcer of the bone, another is ſwelled into the form of exoſtoſis, which is a fungus of the bone.

This action and living power in thoſe parts (ſo hard and apparently ſo inſenſible), is the reaſon why, when the two inflamed ſurfaces of the bone meet with each other, they unite with continuity of veſſels; thoſe continuous veſſels ſupport one another in their action, and ſecrete bone ſometimes ſparingly, and ſometimes in great profuſion, ſo that the two bones are united by a true vaſcular growth, not by a mere inorganic effuſion, ſoldering the bones together; this is the nature of that concretion of bones which we call anchyloſis, where the continuity of veſſels is ſuch, that the anatomiſt, by injecting the veſſels of the one bone, injects the other through the intermediate callus *.

## OF THE FATTY FIMBRIÆ.

Of the FATTY FIMBRIÆ. The only parts which we are entitled to deſcribe as the lubricating apparatus of the joint, are the fatty fimbriæ which lie in the bottom of the ſocket, although the glandula innominata galeni continued, for Galen's ſake, to be deſcribed by the early anatomiſts, and that as confidently as if they had been able to demonſtrate a diſtinct and appropriate gland. But there is no ſuch thing; there is no formal gland; there is nothing which we can certainly pronounce to be glandular. There are indeed certain fringes and fimbriæ ſurrounded with fat, manifeſtly ſecreting a lubricating mucus, which can be ſqueezed out from them; but this mucus bears no proportion to the quantity that is required for the eaſy motion of the joint, the ſynovia ſmegma or lubri-

* The drawing in the laſt page repreſents one of the moſt ſingular accidents; the neck of the thigh bone was broken, the head remained within the ſocket, the head of the thigh bone and its acetabulum both inflamed, united, and became one piece of bone; and this new bony ſurface, which was four inches in breadth, was flat and ſmooth, formed a flat articular ſurface for the upper part of the thigh bone to reſt upon; the upper part of the thigh bone remarkably enlarged and flattened, is alſo repreſented. Obſerve then, that in this caſe, the head of the thigh bone broken from its ſhaft, had no ſource of nouriſhment but its central ligament and inveſting membrane.

cating liquor with which the joint is bedewed, is a general ſecretion from all the ſurfaces of the joint, in which thoſe fatty fimbriæ which lie at the bottom of the ſocket, or hang round the neck of the thigh bone, have but a ſmall ſhare; yet theſe fimbriæ, being undeniably the moſt delicate part of the joint, deſerve particular notice.

The fatty fimbriæ lurk at the bottom of the ſocket in a ſort of hollow, formed by a projection of the iſchium at that place in the bottom of the ſocket where the iſchium ilium and pubis are joined; there the central ligament ariſes from the centre of the ſocket with a broad triangular root, and the fimbriæ ſurround the root of the ligament; the hollow or dimple where they lie is covered with the delicate villous lining of the joint. The villous coat is here looſe and ſoft, the hollow in the centre of the acetabulum feels ſoft and pulpy, and the fimbriæ hang out from it into the cavity of the joint. By this connexion of the fimbriæ with the root of the central ligament, they are moved in every motion of the joint, and by lying in this hollow, theſe ſoft and delicate parts are protected and concealed, for the pelvis hangs upon the top of the thigh bone by the upper part of the ſocket, which is deep and firm, while theſe parts lying at the bottom of the ſocket eſcape the preſſure, and feel only, in the moſt gentle manner, the rotation of the thigh bone; but when the trochanter is ſtruck with a violent blow down into the bottom of the ſocket, theſe ſofter and more ſenſible parts are hurt, violent pain enſues, and this bruiſe of the acetabulum, an accident which happens moſt frequently to old women, is followed by high inflammation of the joint, ending ſometimes in caries and anchyloſis.

But boys are ſubject to a diſeaſe different in many eſſential points, for in boys the diſeaſe of the acetabulum begins from a ſlighter blow, or without any blow, and proceeds unaccompanied with pain; it is ſeated not ſo much in the ſoft parts as in the bones, and proceeds from the imperfect union of the three bones compoſing the ſocket, their imperfect oſſification, their ſoft and vaſcular ſtate. This caries of the hip joint in boys is accompanied with little pain, there is much ſwelling from the vaſcular and ſuſceptible condition of their bones, the thigh bone is abſolutely protruded from its ſocket, and the limb is remarkably elongated during all the firſt ſtage of the diſeaſe.

Thus when we conſider, even ſuperficially, the peculiar forms of this joint, and the internal conſtitution of its parts, we begin to underſtand its various affections; we perceive, why a bruiſe of the acetabulum ſhould be very ſevere in the

falls of people heavy, unwieldy, and advanced in years, and why in them the pain and lameneſs ſhould continue long, ſucceeded alſo by a ſtiffneſs or abſolute anchyloſis of the joint, but without any remarkable affection of the bones. We perceive, why in the ſoft and growing bones of boys the diſeaſe ſhould have a deeper ſeat in the bones themſelves, aſſuming more of the form of a conſtitutional or ſcrophulous diſeaſe; and if we conſider the rambling amuſements of boys, their falls in climbing and on the ice, the eagerneſs and thoughtleſſneſs with which they purſue their amuſements, forgetting the hurts they receive, and the Spartan fortitude with which they conceal them, we ſhall not wonder at this affection of the hip joint being the peculiar diſeaſe of boys, nor at its being very rarely obſerved till it is almoſt beyond help. From the inſenſibility of the bones, the joint is ruined before the boy begins to complain, juſt as a pſoas abſceſs is perceived at the groin, far from the ſeat of diſeaſe (which is in the lumbar vertebræ) before the caries of the vertebræ is even ſuſpected.

From the imperfection of the ſocket at its lower part, the thigh bone is apt to be luxated downwards; and again, from the great length of the limb acting as a lever, and from the whole weight of the body reſting upon this joint alone, it is often luxated upwards, by being twiſted out of its ſocket. From the obliquity and unfavourable direction, together with the actual ſmallneſs of the neck of the thigh bone, it is often broken acroſs; and from the blow upon the trochanter ſtriking down the head of the bone into the bottom of the ſocket, the ſoft parts are hurt, the whole lining of the ſocket inflames, and the joint falls into irrecoverable diſeaſe.

It is further to be obſerved, that this joint is covered by big and powerful muſcles, ſo that when the neck of the thigh bone is broken, it is ſo violently retracted, that the two ends are not regularly oppoſed to each other, and are never rightly reunited! when the thigh bone is luxated, it is ſo retained by thoſe ſtrong muſcles, that its immediate reduction is not eaſy, and the diſtorted head of the thigh bone is ſo braced down againſt the large bones of the pelvis! whence it contracts ſtrong adheſions, and its reduction after ſome interval of time is abſolutely impoſſible: and laſtly, when the acetabulum is injured, ſuch is the weight of this maſſy limb, that the ſlighteſt movement of it gives excruciating pain, hence the patient lies for many months exhauſted with fever and pain, bent into the poſture which he can beſt endure till anchyloſis is formed, and then he riſes with a lame and waſted limb, the thigh bone immoveably united with the pelvis,

and the thigh very frequently ſtanding out at right angles from the body. But worſe than all, this deepneſs of the hip joint, ſurrounded by ſuch thick and maſſy muſcles, prevents us diſtinguiſhing eaſily theſe various diſorders! the dreadful pain which the ſlighteſt motion produces, frightens the ſurgeon from thoſe examinations in which his patient's ſafety entirely conſiſts, and luxation, which is ſo eaſily reduced, often paſſes for fracture, ſo that the reduction is neglected or is miſtaken for a bruiſe of the acetabulum or ſome incurable hurt, till the luxation itſelf becomes incurable. So much do ſurgeons deſpair of doing any eſſential ſervice in diſorders of the hip joint, that if they fail to diſtinguiſh the nature of the accident at once, they apprehend that twiſting ſuch a limb, and torturing the patient, is but an unmeaning cruelty.

Thus you find yourſelves ſlightly initiated into certain pathological doctrines which muſt be more fully explained.

## GENERAL PATHOLOGY OF THE HIP JOINT.

The ſoft parts of the living body, when they loſe their principle of life, die at once, are diſſolved, and periſh, but the bones, after death, retain their former properties ſo perfectly, that in reaſoning on their diſeaſes, we almoſt forget that they ever were alive. Phyſiologiſts have been ſlow in arriving at the right knowledge of the bones, and pathologiſts have been ſtill ſlower in applying that knowledge to the ſtate of diſeaſe; the inflammation and exoſtoſis or ſwelling of bones, the caries, ulceration, or eroſion, as it has been called, of bones, the various changes produced by diſeaſe, have never been explained by the living action of the veſſels of the bone. The ignorant man regards the bones merely as bones! and bones, in his eſtimation, are juſt what he ſees them on the anatomical table or in the cemetery! there they appeared as perfect as while they made part of a living body! if ſuch a bone were broken, the breach could be repaired by any ſubſtance capable of concreting firmly round the broken ends of the bone! and he never conceives any more complicated idea of the reunion of a fractured bone in the living body than ſuch a concretion, a pouring out of ſome oſſific juice which concretes round the fractured part.

Is a joint ſtiffened by anchyloſis, then it is the coagulation of the ſynovia that glues the bones ſo firmly together that they loſe their motion! Is a luxation from length of time become irreduceable, it is becauſe in the intermediate ſpace the

exudation of the ſynovia into the ſocket has filled it up! is there formed a new ſocket upon the back of the haunch bone, or has the head of the thigh bone changed its form, have exoſtoſes and prominences of fantaſtic ſhapes been produced round theſe bones, that too is from the coagulation of the ſynovia, or the concretion of an oſſific juice! is the bone carious, that never is regarded as an ulcer of a living bone; the bone is regarded merely as a dead and inanimate part invaded by ſome diſſolving fluid, whence the ulcer is termed an *eroſion* of the head of the bone or of the ſocket, it is ſaid to be *corroded* by ſome chemical menſtruum, juſt as it has been affirmed time immemorial, that blood diſſolves bones. Petit, in a ſuperb diſſertation on the cauſes of anchyloſis, attributes every thing to the ſynovia, to the defect or ſuperabundance of it, to its *acrid* or its *acetous* vices *, and the ſtiffneſs, the dryneſs, the ſimple anchyloſis of the joint, the eroſions and caries of the ligaments, cartilages and bones, and all the other conſequences of *acrid ſynovia*, he very fully deſcribes †. This deſtructive liquor is not deſcribed by Juſtamond as by Petit, under the title of *Synovie Aigre;* it is not exactly vinegar, though it is ſomething as bad, which diſſolves the cartilages, and produces caries of the bones; "the *glands tumefy*, and ſometimes produce a ſynovia, which, partaking of the diſtempered nature of the organs that ſupply it, is not entirely abſorbed; or elſe this liquor degenerating BECOMES ACRIMONIOUS, DESTROYS THE CARTILAGE lining the ſurface of the joint, and the head of the bone; the articular and capſular ligaments *are eroded with caries*, and in proceſs of time," &c. But in truth, ſuch acrid, acid, eroding ſecretions, have no more to do with the deſtruction of the bones and cartilages, than the thin ichor of a chancre has with the ſore from which it proceeds, which nei-

* "Dans tout ce que nous avons dit juſqu'ici des cauſes de l'anchyloſe, on a pû remarquer que la ſinovie a beaucoup de part à la formation de cette maladie, et qu'il n'en eſt preſque d'aucune eſpece où la ſinovie ne ſoit pour quelque choſe; mais nous allons traiter ici expreſſément des vices de cette humeur, ſçavoir, ſa quantité excedente ou défaillante, et ſa qualité âcre, aigre, ou ſereuſe; vices qui ſont les ſources d'un grand nombre," &c.

† "Si l'âcreté augmente, le déſordre augmentera auſſi. Les cartilages ne ſeront pas ſeulement privés de la liqueur onctueuſe qui les lubrifie, leur ſurface lice et polie, corrodée par l'âcre, deviendra inégale et raboteuſe; les ligamens, inſenſibles au mouvemens des os et aux attouchemens de la ſinovie naturelle, ſeront dans le repos même, ſuſceptibles de douleur. L'action de l'âcre les irritera et leur cauſera un phlogoſe d'autant plus douloureux, qu'ils ſont attachés à des corps durs et inflexibles, qui ne peuvent en prêtant partager avec eux leur tenſion inflammatoire. Ainſi toute l'articulation s'enflamme, l'âcre fermente avec les ſucs nourriciers, et bientôt les os ſe cariants et les ligamens ſupurants, il ſe forme une anchyloſe des plus formidables."

ther produces the ſore, nor can produce a ſimilar ulcer in the adjacent parts. The *ſoldering together* of bones, and eſpecially the *ſoldering together* of the acetabulum and thigh bone, are expreſſions continually repeated by Juſtamond, Gouch, Pott, Bromfield, Warner, Petit, and all thoſe authors who have written on the bones or on fractures; but if there be meaning in figurative language, ſuch expreſſions imply either very imperfect notions, or doctrines totally oppoſite to truth.

This doctrine of acrimonious ſynovia and exudation of oſſific juices has no manner of analogy with the parts even the moſt inanimate of a living body, if it be indeed rational to ſuppoſe the bones leſs perfectly alive than the ſoft parts, when in truth the whole joint, and all the parts which compoſe it, inſenſible as they ſeem, are yet endowed with living powers.

The bones, cartilages and ligaments, though ſlow to enter into diſeaſe, though their diſeaſes are not at firſt announced by pain and immediate ſwelling, yet undergo the ſame changes with the ſoft parts. A fractured bone inflames, granulates, and unites again! who, indeed, can doubt this, who has ever obſerved a carious bone exfoliating, or has remarked the granulation and healing of a trepanned ſkull? When a bone or a joint is injured, the ligaments and ſurrounding ſoft parts maſs and thicken by inflammation, cling to the bones and ſupport them; when a bone is fractured, it unites with the oppoſite broken end of the ſame bone; when a bone is not oppoſed, or not ſteadily oppoſed to another fractured bone, the continuity of veſſels cannot be renewed, but ſtill the veſſels are excited, they ſecrete bone, and form new bone or callus within the ſubſtance of the ſurrounding ſoft parts, ſo that the broken ends of the bones, thus thickened and expanded, form new ſurfaces wanting indeed the properties of joints, but yet allowing of a degree of motion without pain. When a bone is luxated, and remains ſo, there alſo there is much laceration of the ligaments and ſoft parts, much inflammation, a high excitement of veſſels, a ſecretion of bone, and often ſomething repreſenting the original ſocket is formed upon the convex ſurface of a great bone, as of the ſcapula or haunch bone. The ſurrounding ligaments always thicken in proportion to the violence done to the joint; the cellular ſubſtance alſo is inflamed and thickened, the ligaments, inſenſible as they appear, not only inflame, but granulate and adhere with the fractured or luxated bone †, and unite and maſs along with the ſurrounding ſoft parts. There is

† Even Petit, whoſe pathology of the bones is in all reſpects deſpicable, ſeems to have witneſſed, very

another very ſingular conſequence of this inflammatory action among the injured parts, and it is this, the ſurrounding cellular ſubſtance, ligaments, &c. are inclined to adhere at that part of the bone where there is little motion, and where the bone or the ſoft parts formerly connected with it are lacerated, while the ſame cellular ſubſtance and lacerated ligaments continue diſconnected with the head of the bone, which is lubricous and ſmooth. Thus, a bone, whether fractured or luxated, contracts new adheſions, new connexions, and forms for itſelf among the cellular ſubſtance, new capſules and ligaments of ſuch thickneſs and ſtrength too as not merely to bear the motions of the new joint, but ſuch as to ſuffer the whole weight of the body to reſt or hang upon them.

What does the ſurgeon underſtand concerning this moſt intereſting department of his profeſſion, unleſs he is able to make rational conjectures concerning thoſe changes, to diſtinguiſh the various affections of a joint, to obſerve and watch the progreſs of the diſeaſe, and to conduct it prudently; to appeaſe the inflammation if poſſible, but to favour, on the contrary, the generation of bone, and the eſtabliſhment of anchyloſis where no better cure can be expected. Thoſe doctrines which diſgrace the writings of Petit, Juſtamond, and the beſt modern ſurgeons, have done infinite harm in practice. Have not ſurgeons, when the Olecranon was fractured, kept the fore-arm bent in a poſture the moſt painful and the moſt ruinous to the ſtructure of the joint, in order to make room by the diſtance of the bones for any exceſs of callus? fearing leſt the callus being in great profuſion ſhould run into the cavity of the joint. Have they not for the ſame reaſon bent the knee in fractures of the patella? Have not the moſt celebrated ſurgeons moved diſeaſed joints morning and evening with moſt deliberate cruelty, in order to do we hardly know what! to waſte the ſuperfluous ſynovia †, to prevent its accumulation, to

often, the very beginnings of this intereſting proceſs, and to have ſeen this granulation of the ligaments, and this fleſhy condition of fractured bones, when they were ſo ſoft, as to bleed when rudely touched.

" J'ai trouvé, dans l'ouverture d'un ſemblable abcès, que les os étoient *carnifiés;* je veux dire que la tête du fémur et la cavité de l'iſchion, éloignées l'une de l'autre par la luxation, mais toutes deux découvertes par l'ouverture de l'abcès, avoint la même conſiſtance et la même couleur que la chair. Le volume de ces os étoit conſidérablement augmenté, et *ils étoient ſi ſemblables à la chair qu'ils ſaignoient au moindre attouchement.* Cette obſervation n'eſt pas la ſeule que j'aie de cette eſpéce, j'en rapporterai, dans la ſuite, pluſieurs qui ne ſont pas moins ſurprenantes; et qui prouvent que ſi les chairs s'oſſifient, les os peuvent auſſi devenir ſemblables aux chairs."

† La ſynovie s'épanchant continuellement dans l'article, s'y épanchant même alors plus que dans l'état naturel, et n'étant plus *diſſipée par les* mouvements de la partie, on ne doit point être ſurpris qu'elle s'accumule, et qu'elle rempliſſe la cavité au point de chaſſer la tête de l'os, &c.

force it to re-enter into its ducts ‡; have they not tortured and bent joints in the very act of forming anchyloſis, or in other words, when the oppoſite veſſels of the bones have been uniting with each other? Have they not given pedantic directions for the period at which ſuch motions ſhould be begun §? Mr. Freke's chemico-mechanical illuſtration of the acrimony of the ſynovial liquor will not, I believe, be ſoon forgotten, who compares the ſynovia with "olive oil for locks, but if in place of it oil of vitriol be uſed, ſays Mr. Freke, the effect need not be told."

### PATHOLOGY OF LUXATION.

It has been, perhaps, too little obſerved, that the cauſes of luxation and of fracture, are as different as the cauſes of hydrocele and aneuriſm; fracture always, or almoſt always, ariſing from a fall, a blow, or a violent ſtrain of the muſcles; while luxation as certainly ariſes from a twiſt of the joint, and happens only when the weight of the body, in ſome awkward poſture, comes to bear entirely upon the joint, the limb being ſo far out of its natural direction, as to be entirely beyond the power of its own muſcles.

The two great joints of the ſhoulder and hip are peculiarly liable to luxation, firſt, Becauſe they are ball and ſocket joints moving in all directions with a free and circular motion; ſecondly, Becauſe of the length of the limb to which they belong! for the joint is at the trunk of the body, and in any unlucky poſture and twiſt of the limb, the whole weight of the body reſts upon the joint, and the limb ſerves as a long lever by which the head of the bone is twiſted out of its place. But as for the elbow and wriſt, knee and ancle, they have but one motion, they are merely hinge joints, they are ſecured by bones, or by ligaments equivalent in ſtrength to bones, they are rather fractured than luxated.

It is when the body ſlides or falls that the ſhoulder or hip are luxated, for then the whole weight of the body falls on the joint and burſts it up. If a man be ſtruck, for example, upon the top of the ſhoulder, or if being thrown from his horſe he pitches upon the ſhoulder, ſuch accident may break the acromion which projects and defends the joint, or may fracture the clavicle which is the hinge as it

‡ Ou remuë ſouvent la jointure pour obliger la ſynovie a rentrer dans ſes *couloirs*.

§ Le temps et la façon de mouvoir les jointures *diſpoſé* a *l'anchyloſe* ne ſont pas une choſe indifferente, ou a deja dit qu'il ne faut commencer de les remuer que quand la violence des douleurs eſt paſſée, il eſt tres dangereux, &c. one might venture to prognoſticate, that being a joint, moved ſoon after the pains of a diſeaſe, about to terminate in anchyloſis, thoſe pains would not be long of returning.

were upon which the arm rolls (the only point indeed by which it is connected with the trunk of the body), but cannot luxate the joint. The ſhoulder is uſually luxated, when having ſlipped a foot we put out the arm to ſave us from the fall; the arm is at its full ſtretch, is raiſed and extended as high as the joint will allow; the joint can allow of no further extenſion without burſting, and the limb is beyond the command of its muſcles: in this critical poſture is the arm when the whole weight of the body falls upon it; the length of the arm is as a lever for twiſting the humerus out of its ſocket, the joint is burſt up in an inſtant with a craſh and laceration of its ligaments, which is very ſenſibly felt by the man himſelf, and the head of the bone is thruſt down into the axilla, or is puſhed perhaps under the pectoral muſcle.

In like manner is the hip joint luxated by a twiſt, and not by a blow; a blow ſeparates the head, or breaks the neck of the thigh bone, or bruiſes the acetabulum, but ſeldom if ever luxates a joint. For example, when a man ſlips his foot, the limb glides in under the body, the knee is ſtraight, the outer ancle ſlides along the ground; the leg in this oblique poſture bears the whole weight of the body, the chief ſtreſs is upon the hip joint, the thigh bone ſtarts up from its place, overleaps the cartilaginous border of the ſocket, and lodges on the back of the haunch bone or in the ſciatic notch: Thus is the thigh bone luxated upwards.

But if a man, for example, in driving a loaded cart, obſerves it heeling in a bad road, and likely to overturn; if he ſtrides out with one leg, plants it cloſe to the wheel, and tries with his haunch to ſupport the carriage; if in this poſture, and with the leg extended, he is unable to ſupport the carriage and it falls upon his haunch, then the extended leg is as a long lever upon which the weight operates; it burſts up the joint, forcing the head of the bone from its ſocket down into the ſciatic hole or into the groin. The effect is quite the ſame, when a man in loading, for example, a ſack of corn upon a cart, lays it upon the cart, and expects another perſon in the cart to ſupport it, who, on the contrary, allows it to fall back upon him juſt when he is retreating, has moved one leg, and has the load half ſupported with the other leg and hip. The effect is the ſame, when a man loaded with a burden on his back ſlips his foot and falls, ſo that the inſide of one knee ſtrikes the ground and ſuſtains the whole weight of the body, the other having ſlipt from under him; and ſtill it is from a twiſt that the thigh bone is puſhed downwards, when a horſe rears, falls backwards upon his rider and luxates the haunch, or when a man buried into a mine or pit, or cruſhed under the weight of earth falling in upon him, has his hip luxated.

In what degree the ligaments of the joint will extend when they are gradually dilated by a collection of ſerum within, we need not at preſent diſpute. Unqueſtionably they are capable of diſtenſion, of almoſt incredible diſtenſion; but that the head of the thigh bone ſhould be all at once diſplaced by a twiſt, forced clear out of its ſocket over the back of the haunch bone, and lodged in an inſtant at the diſtance of four inches from its natural place, without laceration of its ligaments, with its ligaments merely dilated, is impoſſible. There is, indeed, no fact of which we are better aſſured than this, that when the head of the bone is twiſted out of its ſocket, there is no dilatation of the capſule, there is no ſublaxation, as it is called! the head of the bone never ſtands upon the edge of the ſocket, for then it would immediately fall back into its place; but the capſular ligament is burſt, the central ligament is torn up from its root, the muſcles which lie in the thyroid hole, or on the back of the haunch bone, are diſplaced, to make way for the head of the thigh bone, which lies betwixt the naked haunch bone and thoſe lacerated muſcles, and there it remains, undergoing changes which are of the moſt intereſting nature.

### OF LUXATION OF THE FEMUR DOWNWARDS.

1ſt, While the head of the bone lies thus among the lacerated parts, the ſlighteſt motion occaſions excruciating pain, and as the ſlighteſt motion prevents adheſion, the head of the bone continues long reducible. When the bone is firſt driven out of its ſocket, the patient hears the craſh of the lacerating ligaments, and when a recent luxation is reduced, the head of the bone being diſtorted in reſpect of its poſture, and very firmly braced down by the contorted muſcles, goes home into its place with a violence proportioned to the tenſion of the muſcles with a loud ſnap; but when an old luxation is reduced, the reduction, which is oppoſed by the ſtrong adheſions, requires a force equal to that by which the bone was luxated, if not greater; and in the inſtant in which the adheſions give way to that force, the patient and the ſurgeon both feel the ſame craſh of laceration which accompanied the firſt diſplacement of the bone; it often ſounds as if the neck of the bone were broken by the violence. This is the ſign of the luxation being reduced, and the ſurgeon ſhould be aware of it; for I have often been ſenſible of this craſhing and laceration among the ligaments, which announces the yielding of the diſlocated bone; but as the head of the bone does not, in ſuch old laxations, go home with a ſudden nor diſtinct ſnap, the extenſion has, to my certain knowledge, been often continued, even after the bone has been reduced, and that

with a degree of violence almoſt ſufficient to tear the limb from the body. Obſerve this in your future practice, and you will find that I am not incorrect; and if what I have alleged be true, the vis percuſſionis (far from being a ſubject for thoughtleſs jokes) is perhaps abſolutely neceſſary to the reduction of old and confirmed luxations.

2d, Though the capſule ſo entirely ſurrounds the joint, that it can in no caſe eſcape ſudden laceration when the head is driven from its ſocket, yet the muſcles, which are ſmall, which turn round the joint with ſmall tendons, and are implanted about the roots of the trochanters, and are but ſlightly connected with the capſule are very ſeldom torn. The head of the bone burſts ſheer through the capſule, and tears it in a very irregular way; but it paſſes out betwixt the tendons of the muſcles, without tearing them; therefore it happens, that as ſoon as the bone is reduced, as ſoon as the head of the thigh bone is drawn out from among the lacerated parts on the back of the haunch bone, and again lodged in its proper ſocket, all pain ceaſes, the patient exclaims that he is relieved; and as the muſcles preſerve their attachments to the bone, and are now reſtored to their offices, he moves the joint as eaſily, and walks upon it as firmly as before, and returns to his buſineſs or pleaſures ſometimes without one day's interruption; and though the capſule is completely lacerated, yet as it is connected on its external ſurface with the ſurrounding parts, and theſe alſo are injured, they ſwell, and the ſurrounding parts being cloſe, the edges of the lacerated capſule are regularly oppoſed to each other, and the entireneſs of the capſule is ſoon and eaſily reſtored; reſt is not neceſſary to theſe adheſions.

3d, When the head of the bone *remains unreduced*, new and important changes take place on the head of the bone itſelf, and on the part againſt which it reſts. When the thigh bone is luxated downwards, it diſplaces in ſome degree the obturator muſcle, and reſts in the hollow of the thyroid hole covered by the lacerated muſcle, and preſſing againſt the bone, and there it lies braced down by the diſtortion of the other muſcles. The ſurgeon cannot turn it in examining the parts, except in a very ſlight degree, ſo firmly is it embraced by the muſcles; and beſides, the patient is careful to prevent even the ſlighteſt motion, for motion is productive of excruciating pain. He lies immoveable for ſome weeks! the hollow in which the head of the thigh-bone lies, is lacerated and raw; the parts ſurrounding the neck of the thigh bone are alſo lacerated, which parts mutually adhere ſo as to form a new and perfect capſule. The head of the bone reſting in the thyroid hole, as in a ſocket, comes at laſt to move in it with a degree of eaſe; and

the pelvis, reſting thus fairly upon the head of the thigh bone, is ſteadily ſupported; and though the leg is much lengthened in this luxation, ſo as to make the patient halt towards the ſound ſide, yet the limb thus luxated downwards bears up the body firmly.

This is one ſtriking peculiarity of the luxation downwards into the thyroid hole. But ſtill farther changes take place, very ſlowly indeed, for the changes I mean now to ſpeak of affect the bones themſelves. It ſeems to be after the thigh bone is fixed in its new ſituation, and after the continuity of veſſels is reſtored, that the bones begin to change their form. The ſoft parts connected with this ſurface of the pelvis are all ſwelled, vaſcular, inflamed, and in the condition of the perioſteum and ſoft parts ſurrounding a fractured bone. This maſs of active veſſels connected directly with the veſſels of the bone itſelf, draws them alſo into an active ſtate. A ſecretion of bony matter begins, the new bone is depoſited in the now inflamed capſule in the ſurrounding cellular ſubſtance, and among the lamellæ of the obturator ligament, againſt which the head of the bone reſts, and which is of courſe irritated and inflamed. The thyroid hole comes in time to be filled up with oſſification, ſo as to make a bottom for the new ſocket. The edges of the thyroid hole ſprout out ſo as to form lips or edges for the ſocket; and theſe edges ſometimes are ſo deep as to ſurround entirely the neck of the thigh bone, and to form a complete box of bone *, in which the head of the thigh bone is ſo encloſed, that though perfectly moveable, the head cannot be diſengaged from its new ſocket.

Nor does even the thigh bone itſelf always retain its original ſhape; while excitement enlarges a bone, preſſure, on the contrary, prevents its growing in a young perſon, or even leſſens it when full grown. The thigh bone, when thus luxated, bears the weight of the body in a new direction, the obliquity of the neck is loſt, the head of the bone now receives the preſſure in one direction only, whence the head of the bone is flattened, and the neck is in time depreſſed, loſes

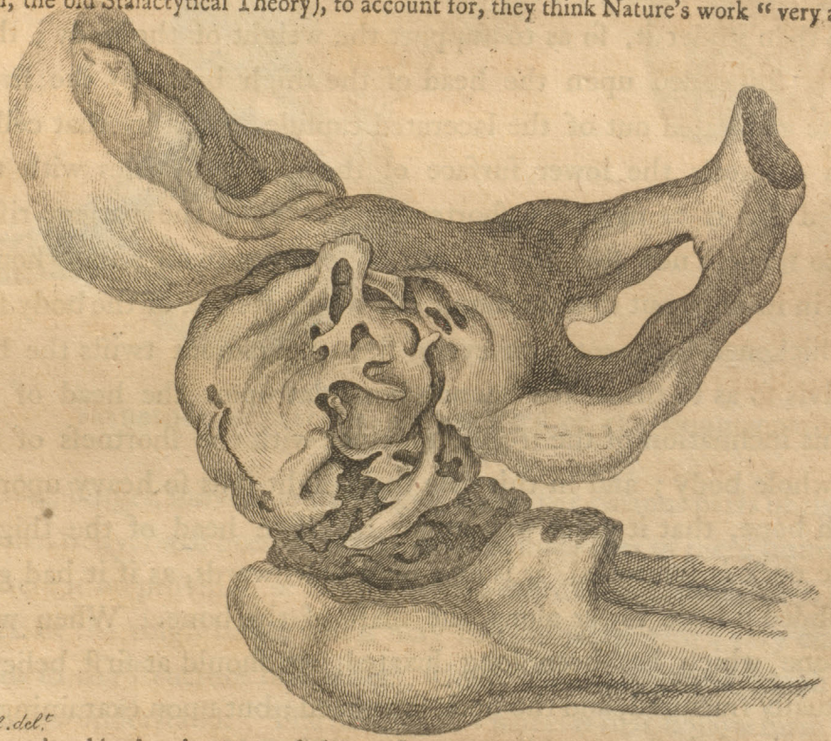
* Mr. Morreau, deſcribing ſuch a natural cure, remarking this profuſion of new bone, and not underſtanding perfectly the proceſs of oſſification, conſidering always callus as ſomething very different from natural bone, and never reflecting on this, that every piece of bone, when injured, when its veſſels are opened, and the parts torn all around it! is apt to produce more bone, makes the following unphiloſophical remark: "Nothing can be DROLLER than the unequal diſtribution of the oſſeous matter which ſpreads to the contiguous parts, for there are BONY VEGETATIONS at the upper part of the great trochanter which are of no USE in the CONSTRUCTION of this BOX (Boete Oſſeux). In ſhort, the gentlemen of the French Academy talk on ſuch occaſions as if Nature deſigned ſpecifically and abſolutely to make a box of a particular ſhape and ſize, and then having ſet Nature her taſk, and finding the box not exactly faſhioned according

all its obliquity, is ſhortened, and ſtands out at right angles from the ſhaft of the bone; and as the ſhoulders and neck of the bone now preſs againſt the lower part of the empty ſocket, that part yields to the preſſure, the lower edge of the ſocket is depreſſed inwards, and the general cavity of the ſocket, now forſaken by the head of the bone, is almoſt filled up.

### LUXATION OF THE THIGH BONE UPWARDS.

4. When the thigh bone is luxated upwards and remains unreduced, the new joint and all its apparatus is leſs perfect, and the patient continues very lame. The

to their imagination, and ſeeing irregularities which they did not expect (and which they have no theory, except, indeed, the old Stalactytical Theory), to account for, they think Nature's work "very abſurd and droll."



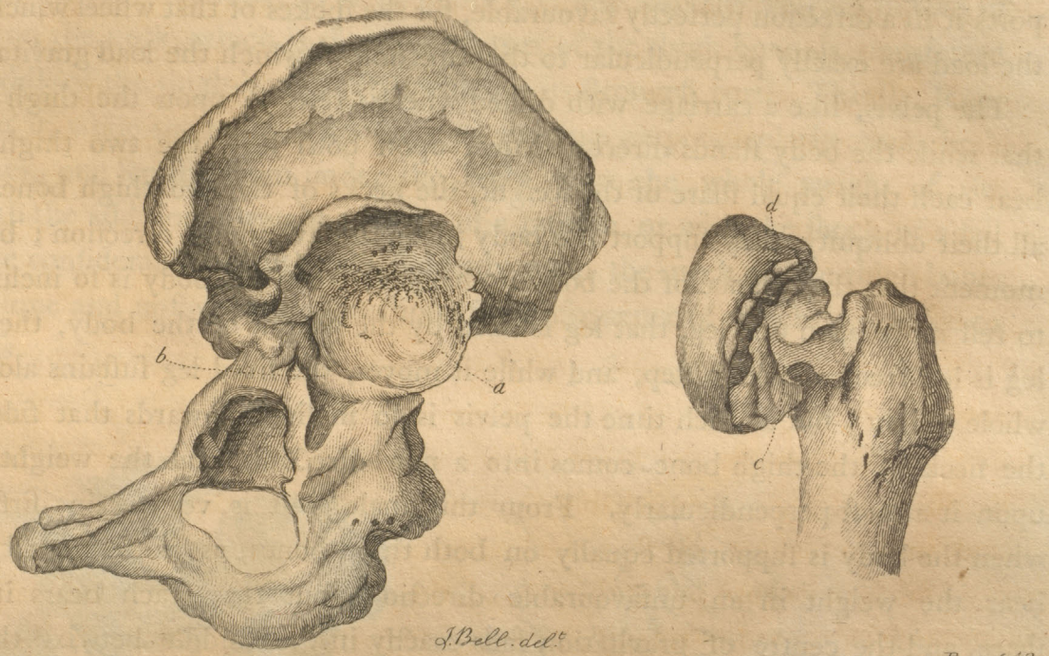
*J. Bell. del.t* *Page 541.*

I have given in this drawing one of the moſt extraordinary facts in this department of pathology. I have repreſented here a thigh bone which was luxated downwards and backwards into the ſciatic notch, and there formed for itſelf a new ſocket, where, though entirely encloſed in the box, as the French academicians have choſen to call it, it was ſtill entirely moveable. "Coxa eſt ſiniſtra cum oſſe femoris, cujus caput intra profundiſſimum acetabulum ſic retinetur, ut, licet certo ſenſu mobile et nullibi cum acetabulo concretum ſit, tamen ex eo tolli nequeat." Even Sandifort, a pathologiſt much ſuperior to Morreau and his confreres, is much at a loſs to explain this phenomenon. In one place he ſays, "Tota capſa articularis videtur hoc in parte in os abiiſſe." One thing is very curious, that in this new ſocket there is a certain opening ſeparated from the reſt by a thin partition of bone, through which the veſſels enter which ſupply the joint.

head of the thigh bone is now lodged on the back of the haunch bone, upon a flat and gliding ſurface, the head of the thigh bone obtains a fixed place very difficultly; there is no hollow like the thyroid hole to receive it; the convex head of the thigh bone is applied to the flat ſurface of the haunch bone, ſo as to touch it almoſt by a mathematical point; there is not here, as in the luxation downwards, a variety of ſurface and great extent of bone wrought upon by the head of the femur; the generation of bone is very ſparing; an accidental ſocket is indeed formed, but ſhallow, ſmooth, irregular, not deep, not ſufficient to receive or lodge the head of the thigh bone; it is rather a dimple than a ſolid ſocket, and looks merely as if the haunch bone being ſoftened had been ſlightly impreſſed by the head of the thigh bone. How does the patient walk then in this caſe? Very miſerably; his thigh bone rather lies upon the ſide of the haunch bone than under it, ſo as to ſupport the weight of the body; the weight of the body is ſuſpended upon the head of the thigh bone by the ſtrong ligaments that are generated out of the lacerated capſule, aided by that cellular ſubſtance which connects the lower ſurface of the glutæi muſcles with the bone. The diſlocated leg is remarkably ſhortened, and when the patient riſes on the ſound limb to make a new ſtep, the luxated bone hangs in air; and when the diſlocated limb is in its turn put to the ground, the whole weight of the body falls heavy upon thoſe thickened ligaments; at every ſtep the patient twiſts the body, and turns the pelvis ſo as to throw the haunch bone flat upon the head of the thigh bone, and this inclination of the trunk, together with the ſhortneſs of the limb, diſtorts the whole body; and in this caſe the weight falls ſo heavy upon the neck of the thigh bone, that it gives way under it. The head of the thigh bone is flattened, the neck is ſhortened, it is alſo bent downwards, as if it had given way, as if it had ſlided a little lower along the ſhaft of the bone. When we look at the thigh bone which has been long luxated, we ſhould at firſt believe that it had been actually fractured, and the neck ſhortened; but upon examining the neck, we find no mark of fracture, while we eaſily diſtinguiſh many marks of the long continued preſſure, for the whole of the upper part of the thigh bone, even to the trochanters, is extenuated, the neck is ſomewhat extenuated and bent down, the head alſo is ſmaller than that of the ſound thigh bone, and on the top of the globular head of the thigh bone is a depreſſion or flatneſs, indicating the place where the back of the haunch bone reſted upon it.

In ſuch a luxation remaining unreduced, the weight of the trunk is ill ſupported, the motions of the joint very imperfect, the limb remarkably ſhortened,

and wafted in ſome degree, while the whole perſon is diſtorted and bent towards the lame ſide. Though ſuch luxation happened during infancy, the perſon never recovers, but continues lame, pained, unable to ride on horſeback, eaſily fatigued, equally unfit for buſineſs or pleaſure, and reminded of his misfortune every moment of his life *.



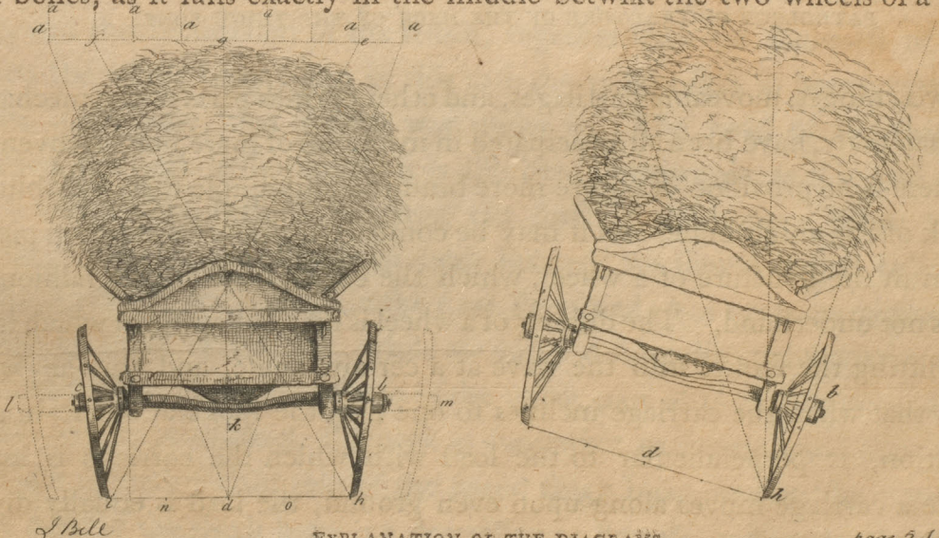

PATHOLOGY OF FRACTURE OF THE NECK OF THE THIGH BONE.

The valves, hinges, moveable cartilages, and other curious parts of the mechaniſm of the human body, have been all anticipated in machines of mere human invention: Perhaps there is no proviſion of nature more beautiful and ſimple than the obliquity of the neck of the thigh bone, and it may be compared with a very curious piece of mechaniſm in the ſtructure of a wheel, which the coarſe hand which faſhions the wheel does not underſtand. The diſhing of a wheel is that hollow form which is produced by fitting the ſpokes into the nave at a certain angle, and this angle is ſo contrived, that when the carriage inclines to one ſide, the ſpoke at a certain angle of inclination, is perpendicular to the load with which the carriage is loaded. Thus while a carriage moves along upon even ground, the load is equally divided

* This is a drawing of a thigh bone long luxated, where (a) ſhows the new ſocket very ſuperficial. (b) The old ſocket almoſt obliterated by the preſſure of the head of the thigh bone on its upper border. (c) The neck of the thigh bone depreſſed almoſt to right angles with the ſhaft. And (d) the head of the thigh bone flattened above by the preſſure of the haunch bone againſt it.

between the two wheels, the ſpokes lie out from the carriage at an angle, the load falls upon the ſpokes of each wheel in an unfavourable direction, but then both wheels bear an equal ſhare of the load. On the contrary, when the carriage moves on uneven ground, and is inclined, it moves upon one wheel only, while the other juſt touches the ground; then one wheel alone ſupports the whole load, but it ſupports it in a direction perfectly favourable, for the ſpokes of that wheel which bears the load are exactly perpendicular to the direction in which the load gravitates.

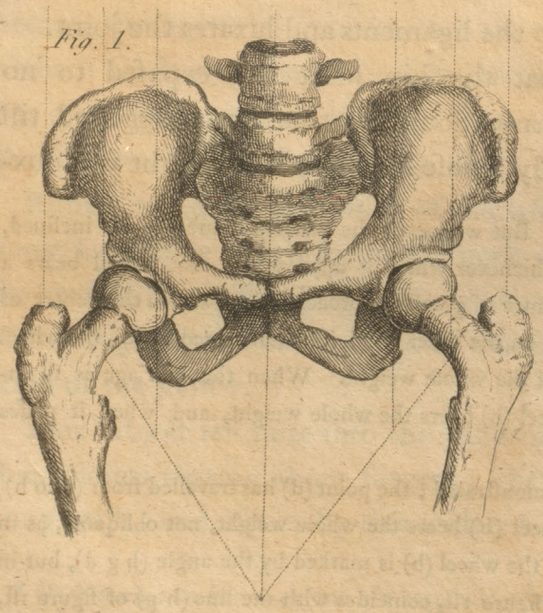
The pelvis, like a carriage with diſhed wheels, reſts ſo upon the thigh bones, that while the body ſtands direct and firm upon both legs, the two thigh bones bear each their equal ſhare of the weight, the necks of the two thigh bones have all their obliquity, they ſupport the body in an unfavourable direction; but the moment that the balance of the body is changed, when the body is ſo inclined as to reſt more upon one leg, that leg is fixed by the weight of the body, the other leg is left free to make a ſtep, and while it moves, the fixed leg ſuſtains alone the whole weight! but at ſuch time the pelvis is ſo inclined towards that ſide, that the neck of the thigh bone comes into a new direction, and the weight bears upon it almoſt perpendicularly. From this analogy it is very plain, firſt, that when the body is ſupported equally on both thigh bones, as in figure 1ſt, they bear the weight in an unfavourable direction; but then each bears its own ſhare, and the centre of gravitation falls exactly in the middle betwixt the two thigh bones, as it falls exactly in the middle betwixt the two wheels of a cart mov-

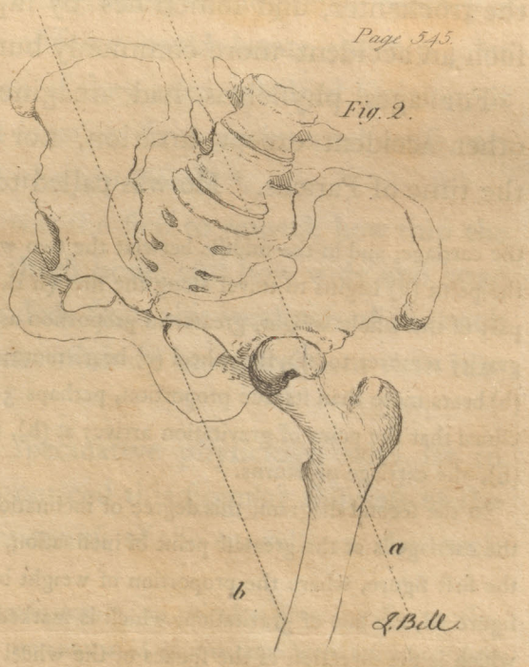



EXPLANATION OF THE DIAGRAMS. page 544

In theſe two plans (a a a) ſignifies the perpendicular direction in which all bodies gravitate, and the angle (d e f) repreſents the whole load, while (d g) repreſents the centre of gravity of the whole. Were a wheel put in at (k) the whole load would be balanced upon that ſingle wheel, but by two wheels the baſis which

ing on level ground. But, ſecondly, That when the body is deſignedly inclined to one ſide, the whole weight falls upon the neck of one thigh-bone, but then it falls upon it in the moſt favourable direction; the gravitation is not perpendicular, it is tranſverſe with regard to the direction of the neck, it is in the direction of the neck itſelf, which is oblique, as at (a figure 2.); and thus the weight, inſtead of falling upon the neck, which is the weakeſt part of the thigh bone, is transferred to the middle of the thigh-bone at (b), which is its ſtrongeſt part. Thirdly, It appears, that if, while the body is ſtanding or moving perpendicularly upon both thigh bones, one leg ſlip from under the body, then the whole weight of the body (with the additional weight perhaps of a burden, or with the ſhock of a fall from ſome conſiderable height), falls ſuddenly upon the neck of one thigh bone, in an oblique and unfavourable direction, in conſequence of which it is liable to ſnap acroſs.




bears the load is broadened, the carriage ſtands firmer, and broadening the baſis ſtill more by prolonging the axle, and removing the wheels to (l m) ſtill further from the centre, the carriage would be ſtill more ſteady. The whole load then is divided equally betwixt the wheels (b and c), and the angle (c g d) ſhows what proportion of the weight belongs to the wheel (c), while (i g) ſhows the oblique direction in which the ſpokes of the wheel (c) bears its load, the angle (h g d) ſhows the ſhare of the weight which the wheel (b) bears, while (h g) ſhows the direction in which the wheel (b) bears its load. The reſult of this demonſtration is, that the load is born by the wheels (b and c) equally, becauſe the centre of the whole load (d) is alſo in the centre of

Thus our body is every where perfect and imperfect; wherever there are particular proviſions of nature, we are ſure there is ſome weakneſs or defect. This obliquity of the neck of the thigh bone is at once the cauſe of its weakneſs and of its ſtrength. Firſt, It is neceſſary that the joint ſhould move in large and free circles; and for this purpoſe the head is ſet off from the ſhaft of the bone by a conſiderable length of neck. The poſition of this neck, which is almoſt tranſverſe in many circumſtances to the gravitation of the body, is the cauſe of its frequent fracture. When a man dropping himſelf from a window, expects to light equably upon both legs, and the whole force falls upon one *; when a man going down a ſtaircaſe which has no rail, walks over the ſide of the ſtaircaſe in the ſame poſture as if he were making a fair ſtep; when a man walking along on even ground falls into a pit, for example, into the unguarded foundation of a houſe, he is liable to break the neck of the thigh bone, which is alſo ſometimes broken by a blow upon the trochanter, and ſometimes by ſlipping the foot, and falling ſidelong, though ſuch an accident more commonly burſts up the ligaments and luxates the joint.

For ages phyſicians had imagined, that the hip joint was expoſed to no other accident except luxation, nor was any doubt of this ever ſuggeſted till the time of Paræus. He was called to a lady whoſe hip joint he thought was lux-

the carriage, and in the middle betwixt the two wheels. But whenever the carriage comes to be inclined, the point (d) begins to travel along the line (h i), and whichever wheel it approaches, that wheel bears a part of the whole weight, greater in proportion as the centre of gravity approaches it. When the center of gravity removes to (n), the wheel (c) bears more; when, on the other hand, it is transferred to (o), the wheel (b) bears more than its due proportion, perhaps 3-4ths of the whole weight. When the carriage is ſo inclined that the point of gravitation arrives at (h), the wheel (b) bears the whole weight, and when it paſſes (h), the carriage overturns.

In the ſecond diagram, this degree of inclination is demonſtrated; the point (d) has travelled from (d to h), the carriage is at the greateſt point of inclination, the wheel (b) bears the whole weight, not obliquely, as in the firſt figure, where the proportion of weight born by the wheel (b) is marked by the angle (h g d), but in figure 2d, the line of gravitation, which is marked (d g) figure 1ſt, coincides with the line (h g) of figure 1ſt, which is the direction of the ſpokes of the wheel (b); for the line (g d), which is the line of gravitation, moves by the inclination of the carriage towards the line (g h).

* " Voici ce que j'ai vû. Un homme voulant deſcendre d'une feneſtre un peu haute, ſe gliſſa le long du mur, le dos tourné du côté de la ruë, et ſe tenant ſur le bord de la feneſtre avec les mains, lorſqu'il ſe fut allongé pour approcher, autant qu'il le pouvoit du pavé, et tomber de moins haut, il lâcha ſes deux mains, et tomba à terre ſur la plante des deux pieds, mais inégalement. Le pied droit porta le premier, et ſouffrit tout le poids du corps, dont la force étoit multipliée par la vîteſſe de la chûte. Le pied, la jambe et le corps du fémur réſiſterent, parce que la ligne de direction du poids du corps tomboit perpendiculairement deſſus; mais le col du fémur, par la raiſon contraire, ſe caſſa à cauſe de ſon obliquité."

ated; he imagined alſo that he had reduced the bone by extenſion, and accordingly he ſecured it with a ſlight bandage, but the next day, when this bandage was undone, he found to his great ſurpriſe the limb ſhortened again, and then only did he become ſenſible that the thigh bone was broken at its neck.

This ſingle obſervation was not unimportant, nor was it overlooked by his contemporaries. The ſame paſſion for novelty which makes every new quackery acceptable in the preſent day, made every new obſervation, eſpecially concerning dangerous luxations and fractures, acceptable to the diligent honeſt people who profeſſed in thoſe days neither philoſophy nor the talent of making diſcoveries! who affected nothing but plain ſurgery. There were not many anatomiſts; their obſervations were few, but they were reſpected, they were, indeed, received with ſuch univerſal enthuſiaſm, that often, as in the preſent inſtance, their new obſervations degenerated into new prejudices. It had been the opinion for many ages that the hip joint could only be luxated; but in the beginning of the preſent century it became the univerſal opinion, that no degree of force could luxate the hip joint without fracturing the neck of the thigh bone; if they acknowledged luxation, it was only that ſpecies of it which they termed luxation from an internal cauſe, or, in other words, the ſuppuration of the joint! the hip diſeaſe *.

Ruiſch, the great anatomiſt of the laſt age, was the firſt to remark how thin the bony lamella is which forms the neck of the thigh bone, and how wide and large the cancelli are in that part. He boldly concluded, from this weakneſs of the neck of the thigh bone, that fracture of that part was infinitely more frequent than luxation of the joint †.

This ſubject fell next into the hands of the ſpeculative phyſicians, who ſat in their cloſets writing about ſurgery; they alſo noticed this ſingular thinneſs of the bony walls, and eſpecially this wideneſs and openneſs of the cancelli in the neck

* Os femoris raro ſola vi externa, ex acetabulo oſſium innominatorum, ex articulari propter vaſtos muſculos et ligamenta articulum munientia! ab AFFLUXU autem HUMORUM id pluries contingere unicuique ſatis notum. RUISCH, page 30.

Fracturam autem facile patitur in ejus collo propter ejus teneritatem, collum enim maxime parte conſtat ex oſſeo-ſpongioſa ſubſtantia inſtar deploes cranii quæ ſubſtantia obducta quidem lamella oſſea dura verum tamen illa eſt admodum tenuis hinc facilius frangitur quam aut articulus ſuo loco excidat.

† Cependant s'ils euſſent fait attention au peu d'epaiſſeur de la lame de ſubſtance compacte qui revêt le tiſſu cellulaire et ſpongieux, dont le col du femur eſt formè ils ouroient aiſement compris qui ſi les violences exteriures ſont capables de deplacer la tête de cet os elles peuvent en un grand nombre de circonſtances occaſionner le fracture de ſon col. SABATIER, page 630.

of the thigh bone, and aſſigned the true cauſe for this peculiar ſtructure. "The neck of the thigh bone has an oſſeous lamella externally no thicker than the nail, and within it is nothing but mere cellular ſubſtance: How, without this peculiarity of ſtructure, could the marrow riſe along the tube of the bone, or exude as it ſhould do into the cavity of the joint? How could this exudation take place without this open texture of the cancelli? This is the reaſon why ſlender people feel always a ſort of pain and wearineſs after walking far ‡."

When once their imagination had gone abroad in ſearch of theories to explain what they had reſolved to believe, they proceeded next to examine the ligaments, and having proved the bones weak enough to account for the frequency of fracture, they made little doubt of being able to prove, by the ſtrength of the ligaments, that they were too powerful to admit of luxation. "This ligament (ſays Boerhaave), this central ligament of the thigh bone, is of ſuch remarkable ſtrength, that though you ſhould take a corpſe, hang it by the heels, and hang a weight of a thouſand pounds round the neck, it will never give way." The obſervation of Fernelius is ſtill more deciſive: "When Count Sebaſtian was executed at Leyden, four wild horſes could hardly tear the limbs § aſunder."

Yet let us do no injuſtice to the memory of Ruiſch. He was perſuaded that fracture of the cervix femoris was the more frequent accident, not merely by this obſervation of the thinneſs of its bony lamella; he ſeems to have enquired into the fact with commendable diligence. "I am informed (ſays Ruiſch) by D. Borſt, who, in the courſe of his ſurgical practice, has many opportunities of opening the dead bodies of cripple old women, that of eight bodies which he had diſſected, he had found not one of them luxated, but in every individual of them there was a fracture of the neck of the thigh bone ‖."

‡ Sed cervix femoris tenuiſſimam habet lamellam vere oſſeam, vix unguis craſſitie reliquum eſt mera ſubſtantia celluloſa. Hoc ideo factum eſt quia maximam partem medullæ femore contenta huc deferri oportet in mediam articuli cavitatem; id vero non potuiſſe contingere niſi ea parte os celluloſum factum medullam ſineret tranſudare." This is good, but what follows is inimitable. Inde! inde fit! ut macilenti homines inter obambulandum quando nimis longa itinera tentant, doloris quemdam ſenſum hic percipiant!!! BOERHAAVE.

§ Hoc uno ligamentum, de quo ſupradictum eſt ſuſpenſorium capitis femoris tanti roboris eſt ut non luxaretur in homine ex pedibus ſuſpenſo etiam ſi capiti libras mille apenderis; quare *nullam unquam luxationem femoris a cauſa externa fieri poſſe*, &c. BOERHAAVE.

Experimentum habet Fernelius "Comitis Sebaſtiani qui Lugduni vix a quatuor incitatis equis diſcerpi potuerit. HALLER.

‖ Dictus Magiſter Borſt, qui in ſuo officio uberiorem habuit occaſionem anuum cadavera aperiendi mihi

To this opinion of fracture being infinitely more frequent than luxation, Boerhaave, as I have already intimated, ſet his ſeal in the moſt deliberate and formal manner, after reviewing all that the others had done. This cloſed the diſpute, and I muſt ſay, moſt unhappily for the public. Let it once be ſuppoſed that the thigh bone can only be fractured, and all other accidents of the joint will be utterly neglected. That all the other accidents, and eſpecially luxations, have been ſo neglected, eſpecially in Holland! that many whoſe thigh bones ſhould have been reduced, had remained lame and miſerable for life, is moſt unhappily proved by the ſplendid muſeums of Ruiſch, Hovius, Vandoveren, Albinus, and Sandifort. But theſe are melancholy proofs, and indeed we have little reaſon to dwell upon them, for the reproach is univerſal, and our ſurgeon Cheſſelden alſo gives drawings of unreduced luxations. This opinion, that luxation could not happen, was received here in England chiefly on the authority of Boerhaave, and prevailed ſo much, that even to the preſent day, in the various collections of caſes, we find numerous examples of the luxation of the thigh, and wonder why ſuch inſignificant caſes, ſo uniform, and all ſo like each other, ſhould be at all received into collections; they are related merely to prove that luxation of the thigh is not impoſſible, as Boerhaave affirmed!

But I make my appeal neither to Paræus, nor Ruiſch, nor Boerhaave, but to the ſtructure of the joint itſelf; to that I return as the ſureſt guide, while the opinions of authors ſerve but as accidental illuſtrations. It is from the inſecure ſtate of the epiphyſis in children *, from the ſingular thinneſs of the neck of the thigh bone in old age, from its tranſverſe poſition, together with the hazardous leaps and falls of men in the prime of life, that this part is expoſed to fracture. To ſpeak impartially, fracture is perhaps more common than luxation, though both are frequent.

### WHY IS THIS FRACTURE INCURABLE?

The difficulty of reuniting the fractured neck of the thigh bone has been too long acknowledged to be queſtioned at this time †, and the peculiar condition of this

retulit ſeſe octies aperuiſſe anuum claudicantium cadavera, et ſemper inveniſſe oſſa in collo fuiſſe fracta; et ne ullum quidem ex-articulatum.

* The Epiphyſis are the cartilaginous heads and proceſſes of the bones which in children are diſtinct parts eaſily ſeparated from the ſhaft or body of the bone, and which are firmly united with it only in the adult.

† Celſus alſo gives his teſtimony to the difficulty or impoſſibility of effecting a cure. Neque tamen igno-

part of the bone, accounts too well for all our diſappointments. The celebrated Deſſault was full of expectation of accompliſhing the cure of this fracture: "Why (ſays this excellent ſurgeon), ſince the bony matter forming the neck of the thigh bone has nothing peculiar in its nature, why ſhould not this fracture heal like that of the other parts of the ſame bone?"‡ The reaſons are many, and not unintereſting.

When a bone is broken, the ſoft parts are thickened around it; there is a general ſoft ſwelling of the limb, accompanied with a particular tumor ſurrounding the fractured part, which tumor is hard and firm, and feels as if there were formed round the bone, a gland-like maſs for the purpoſe of generating callus. When we break the leg of an animal, and examine this thickening, we find the muſcles, the cellular ſubſtance, and the perioſteum thickened, and firmly adhering to the ends of the broken bone, the part is very vaſcular, and it would appear that this turgeſcence, ſwelling, and high action of the veſſels, were determined to the generation of bone, which being generated, the action ſubſides, and the ſwelling and thickneſs diſſolve.

When we take a bone broken twenty years, for example, before the perſon's death, and inject its veſſels, we find that the ſame connection of the veſſels ſtill ſubſiſts, that from the veſſels of the perioſteum the injection penetrates the callus more freely than any part of the bone.

When a bone dies (which death of the bone we term Necroſis), the firſt accident that enſues is ſeparation of the perioſteum from the dead bone, inflammation of the ſurrounding parts, a ſwelling, hard, firm, and limited expreſsly to the necroſing part of the bone; the hardneſs exactly reſembles that of a recent callus; and the iſſue of this proceſs is, that the active ſtate of this maſs forms a new bone, in the centre of which the dead bone remains encloſed.

We find it eſſential to the reunion of a fractured bone, not only that the ends of the bone ſhould be alive, and ſhould have each the inherent power of producing new bone, but that the two broken parts of the bone ſhould be united in their office, that they ſhould actually adhere, that their veſſels ſhould mix, that

rare oportet, ſi femur fractum eſt fiere brevius; quia nunquam in antiquum ſtatum revertitur ſummiſque digitis poſtea cruris ejus inſiſti, ſed multa tamen femoris debilitas eſt; ſi vi fortunæ negligentia acceſſit. Lib. viii. cap. x.

‡ Si la matiere oſſeuſe qui forme le col du femur n'eſt pas dun nature particuliere pourquoi ſa fracture ne gueriroit elle pas comme celle des autres parties du même os; lorſqu'elle eſt reduite et contenue par des moyens efficaees? et pourquoi ſeroit-elle ſuivie d'accidens extraordinaires? Page 353.

they ſhould ſupport each other; and on this account, wherever bones are healing proſperouſly, you can diſtinguiſh outwardly that ſwelling of the parts by which they are held together in this poſture of adheſion.

When the tibia and fibula, the radius and ulna, or any other well ſupported bone, is broken acroſs, the ſurrounding parts, muſcular as well as cellular, are lacerated; and by the inflammation of the cellular and muſcular ſubſtance, in concert with the perioſteum, that maſs is formed, which by the activity of its veſſels, works the blood towards the immediate fracture; and though we cannot ſay, that any organization but that of the bone itſelf is directly capable of regenerating bone, yet we plainly perceive the neceſſity of this thickening of the ſurrounding parts, which is like a temporary gland inſtituted for the purpoſe of ſecreting bone.

Now, when the thigh bone or tibia is broken (ſupported as they are by ſurrounding parts), there is a great inflammation and thickening of the ſurrounding fleſh, by which is formed a large and firm callus. But when the rotula or knee pan is broken, we have to do with a bone which is in very different circumſtances. The muſcles of the thigh are indeed implanted into the rotula, but they are implanted at its edge; except at its upper edge, no fleſhy part touches the bone, it has no medullary canal, no remarkable veſſels! this bone is connected with the tibia below by a ſtrong and hard ligament, its ſides receive the tendons of the vaſti muſcles, its inner ſurface is lined with the delicate capſule of the knee joint, the bone, indeed, lies properly within the joint, and is covered on its external ſurface only by the broad faſcia of the thigh. This bone is inſulated, floating upon the ſurface (as we may expreſs it) of the knee joint, connected only with ligamentous and tendinous parts, and is excluded by the expanſion of the faſcia from any connexion with that ſofter cellular ſubſtance which lies under the ſkin; it is of all the bones in the body the leaſt ſupported by ſurrounding parts, the leaſt apt to reunite. Of forty broken patellas, examined by Calliſen and Camper in the various muſeums of France, Germany, England and Denmark, not one was perfectly reunited. The patella, when broken, is joined only by a ligamentous ſubſtance, long or ſhort, according to the circumſtances of the fracture, or the dexterity of the ſurgeon.

When the patella is fractured, a ſingular puffy emphyſematous-like ſwelling riſes inſtantly over the knee; it feels abſolutely as if the parts were inflated with air. The ſwelling is very great, but very ſoft. In no ſtage of the cure can we

obſerve any knotting or maſſing of the parts round the fractured bone; never was there an exuberant callus known to ſhoot out around a broken patella. The only two patellas which are actually united are in the poſſeſſion of the ingenious Dr. Sheldon; yet even in theſe there is a diſtinct line of imperfect oſſification traverſing the patella, and marking the fracture.

From theſe facts, what ſhould we conclude? Surely this, that a complete reunion of the patella is almoſt impoſſible; the defect exiſts in the part; the ſurgeon cannot be blamed *, though we may, if we chooſe, accuſe Nature of a manifeſt imperfection.

When the neck of the thigh bone is fractured, the capſule ſometimes remains entire; the capſule is of an inſenſible nature, entering very ſlowly into action; and within that ligamentous and inſenſible capſule is included the whole length of the neck of the thigh bone. The neck is ſurrounded with mucous fringes, and the cavity in which it lies is lubricated; the perioſteum and ligaments are ſlow in entering into action or inflaming, even where they are lacerated, but when they remain entire, they exclude all connexion of the fractured bone with the muſcular parts. Thus, unaſſiſted by any of the uſual adheſions, the neck of the thigh bone is left to its own intrinſic powers; naked bone is oppoſed to naked bone, and not very regularly oppoſed, for the ends of the fractured cervix are ſo obliquely placed

* Mr. Sheldon, in his Eſſay upon the Fracture of the Patella, quotes the following paſſage from Mr. Benjamin Bell: "I muſt likewiſe object to Mr. Bell. He ſays, in his Syſtem of Surgery, It is a fortunate circumſtance, however, that it is not abſolutely neceſſary to a complete cure that the different pieces of bone be kept in exact contact. Where IT can be eaſily done, IT ought always to be put in practice; but I know from the reſult of ſeveral caſes where THIS was impracticable, that a cure may be obtained, and the joint be equally firm and USEFUL as IT was before, even although the ſeparated portions of bone cannot be brought within an inch of each other. We ſhould not, therefore, be very anxious about THIS; and inſtead of uſing much force for the purpoſe of drawing the bones into cloſe contact, no more ſhould be employed than the patient can bear with PERFECT EASE."

"Whoever (ſays Dr. Sheldon), follows Mr. Bell, and does not bring the fractured portions of the patella into accurate contact, which may always be effected by bending the hip joint, and bringing down the extenſor muſcles, and ſuperior fractured portion, without giving that pain which Mr. Bell ſays is produced by attempting to bring the fractured portions into accurate contact, WILL UNDOUBTEDLY LAME HIS patient." This remark of Dr. Sheldon's is a piece of honeſt Engliſh ſurlineſs, in which he ſhould not have indulged; he ſhould have conſidered how much Mr. Bell writes at a venture, and ſo have excuſed him for this opinion, if opinion it can be called; he who made the patella could not make a mended one as good as a ſound one, much leſs could Mr. Benjamin Bell. I believe I have aſſigned a reaſon why a perfect cure is almoſt impoſſible.

with regard to each other, that more than the uſual callus would be required for their reunion! and yet they are ſo entirely deprived of any ſupport from ſurrounding parts, that leſs callus is produced, often none! they frequently remain diſunited *.

The neck of the thigh bone, which is completely inſulated in its natural condition, can form, when broken, none of thoſe connexions with the ſurrounding parts which ſhould help to make up a maſs capable of retaining the bones in cloſe contact, and of aſſiſting in the generation of callus. This is the reaſon why all our ingenuity is exhauſted in vain, why each ſucceſſive generation has condemned the inventions of the preceding age. All our hopes of ſucceeding in the cure of fracture in the neck of the thigh bone have been ſucceſſively abandoned, and we are almoſt perſuaded to ſubſcribe to the bold unlimited affirmation of Platner, "Nunquam os ea parte glutinari poſſe nec membrum in antiquum ſtatum reverti." The mechaniſm I have explained is, I fear, a true anſwer to the queſtion of the celebrated Deſſault, "Why ſhould not the neck heal like any other part of this bone?"

But why is the neck of the thigh bone, when it does reunite, ſurrounded with ſo clumſy a maſs of callus? This alſo muſt be explained; for it is a fact, and an intereſting one, and muſt have a place in the account which I am preſently to give of the various conditions in which the fractured thigh bone is found after death.

There are juſt two conditions in which the thigh bone will be found after a fracture of its neck. Along with the fracture of that part of the limb, there may either be much ſhortening of the limb, or very little; there may be a wide laceration of the capſule and ſurrounding parts, or none at all; and theſe two varieties of the fracture draw after them very important conſequences.

Suppoſe a man to miſs a landing place, and for want of light, go over a ſtaircaſe perpendicularly in the attitude of walking forward; ſuppoſe him to fall into an unrailed area, or to drop deſperately from a window, upon the cry of fire; he

* Every where this fact is acknowledged, often in ſuch expreſſions as theſe, "Le cal de femur ne paroit pas propre a fournirs le mattiere du cal." *Memoires de Chirurgie.*—But I find nothing like an explanation of this fact, unleſs, perhaps, ſomething like one were to be picked out of a tranſient expreſſion of Parée, who ſays, "La fracture faite pres des joinctures eſt plus malaiſement guarrie, pource qu'a cauſe des nerfs, tendons et ligamens, communs elle apporte de plus grands accidens ET QUE CE LIEU EST EXANGUE." PAREE, p. 343.

That THE PART IS BLOODLESS, that the ſurrounding parts are little able to contribute their ſhare in the cure, is the very TRUTH.

breaks the neck of the thigh bone, is ſenſible of what has happened to him, and waits the people coming with light. Here the patient lies without ſtruggling, is carefully lifted by his friends, and is put into the ſurgeon's hands, with very little ſhortening of the limb. In ſuch circumſtances, the thigh is ſo little ſhortened, that the ſurgeon is at a loſs at firſt to aſcertain the nature of the accident; and if ſuch patient die of fever, or if the other injuries prove the fall, the capſule is found entire, inflamed, full of ſerous effuſion, and red with the high action of its veſſels, though not lacerated.

But if the man, being ſtunned by his fall, be inſenſible of all the injuries he may have ſuſtained; if, when his friends firſt raiſe him, he ſtrive to ſtand upon the fractured limb; if a man, being purſued, take a deſperate leap, and after fracturing the neck of the thigh bone, ſtill ſtruggle to get on, and actually walk upon the fractured limb; if a drunk man fracture his thigh bone, and be raiſed up by his reeling companions, or by the people accidentally paſſing, and unconſcious of the man's ſituation; if he ſtagger forwards upon the broken limb, the ſurgeon is ſure to find it remarkably ſhortened, it is at leaſt four inches ſhorter than the ſound limb, the trochanter and broken neck of the bone are puſhed upwards, the capſule completely torn, the cellular ſubſtance diſordered, the muſcles lacerated and diſplaced, while the broken part of the bone is buried deep in the midſt of this laceration.

The import of thoſe diſtinctions is greater than you may at firſt imagine. There are two conditions of the fractured bone; the one reſembling the unſupported condition of the patella, the other reſembling the condition of the tibia, or radius and ulna, where there is a great maſs of ſurrounding muſcles connected by cellular ſubſtance with the bone.

*Firſt*, When the capſule remains entire, the limb is little ſhortened, the ends of the broken bone are indeed but little diſplaced, but then they are little capable of reunion. The whole joint is inflamed, the lubricating liquor is poured out in great quantities, ſo that the cavity of the joint is preſerved, and even enlarged; the broken parts remain inſulated; the capſule, hard and inſenſible in its nature, enters ſlowly into diſeaſe; the effuſion enlarges the cavity of the capſule, all its thickening is outwardly (in reſpect to the cavity of the joint), ſo that even the hard and inſenſible capſule never approaches the fractured parts of the bone. The two ends of the broken bones paſs each other, and are not ſupported nor connected together by the adheſion of the ſurrounding parts. They are not regularly oppoſed to each other, and though they were, they would be like the oppoſite

pieces of the broken patella, very unfit to unite with one another; they would be oppoſed naked to each other, bone to bone, and if they did unite, their union would be like that of the patella, ligamentous and imperfect.

It was only after conſidering the circumſtances a good deal, that I could perſuade myſelf of this part being ever in any inſtance fractured without a laceration of the capſule; but I find many evidences of this important fact. There is eſpecially one very accurate diſſection of Mr. Deſſault's, which I will recite to you. It was the diſſection of the hip joint of an old woman, who having fractured the thigh bone by a fall, died the 45th day after. Her thigh had been little ſhortened, no more than an inch and a half; the cellular ſubſtance belonging to the muſcles ſurrounding the joint was thickened; the capſule of the joint was firmer and thicker than it naturally is, and encloſed a quantity of bloody ſerum; the round ligament was torn away from the ball of the thigh bone; the bone was in part alſo uncovered of its cartilaginous ſhell, and had begun to granulate; the round ligament, almoſt entirely ſeparated from the head of the thigh bone, had ſpread itſelf in the bottom of the ſocket; and the fractured neck of the thigh bone was united by a fibrous ſubſtance *.

This bone then was reunited, not with callus, but with ſomething flexible like a ligament, reſembling the ſubſtance by which the pieces of a fractured patella are joined! with what Deſſault terms a *fibrous production*. Whether the bone might have entirely reunited in the end, is ſtill a queſtion; and this only is left certain, that very frequently the proceſs fails, that the ends of the bone continue

* "Le tiſſu cellulaire qui uniſſoit ces muſcles près de l'articulation étoit plus denſe qu'il ne l'eſt ordinairement. Le ligament capſulaire, qui avoit auſſi plus de denſité et plus d'èpaiſſeur que dans l'etat naturel, renfermoit un peu de fluide ſanguinolent. On obſervoit à la partie inférieure et interne du ligament rond, près de ſon inſertion, une petite portion de la tête du fémur dénuée de ſon cartilage et *couverte de bourgeons rouageâtres*. Le ligament rond lui-même preſque entiérement detache de la tête de l'os, s'epanouiſſoit le fond. Le col du fémur étoit réuni par une production, qui avoit l'apparence fibreuſe: cet os avoit d'ailleurs ſa longueur et ſa direction ordinaires." DESSAULT, p. 344.

There are ſome things in this diſſection eſpecially worthy of remark. 1ſt, The thickening of the capſule, and the ſtrengthening of it by the ſurrounding cellular ſubſtance. 2d, The proof of the round ligament ſerving really and truly the purpoſe of a ligament, and reſiſting the force of the blow, retaining the head in the ſocket. 3dly, The ligament, when it is torn partly away, ſinking down into the ſocket, expanding there, as Deſſault expreſſes it, and accounting for the thickening of the parts within the ſocket, and cauſing that ſingular lengthening of the thigh bone which I have mentioned as an accident of luxation. And, 4th, The imperfect reunion of the neck of the thigh bone, and the ſparing callus with which the parts are joined.

unconnected and looſe, and rubbing upon each other with every ſlight motion of the joint, cartilages ſoon cover each end of ſuch a fractured bone, and an unnatural joint is formed, feeble, and almoſt uſeleſs.

*Secondly*, It ſhould be obſerved, that in every oblique fracture, where the bones overſhoot each other and tear the muſcles, the adjacent parts are engaged in the diſeaſe, the maſs of parts affected by the injury is great, and the quantity of callus or new bone is proportioned always to the obliquity of the fracture; ſo it is in this fracture of the neck of the thigh bone. When the patient, unconſcious of the terrible accident which has befallen him, ſtrives to riſe, attempts to walk, reſts the body upon the broken bone, and even falls forwards upon it, the upper part of the fractured bone is driven through the lacerated capſule, the muſcles are diſplaced from their beds upon the back of the haunch bone, and the limb being ſhortened four inches, that difference of four inches in the length of the limb, lodges the broken bone fairly among the lacerated muſcles, or rather among the cellular ſubſtance which belongs to thoſe muſcles. Then the ſlighteſt motion of the limb gives exquiſite pain, the patient is fearful of the ſlighteſt change of poſture, both the ſurgeon is fearful of moving the limb, and the patient is unwilling to have it moved; there the broken bone lies forming new connexions and ſtrong adheſions, and a great maſs of parts is drawn into conſent. Now, it is this which helps to make up ſo large a knot of callus. Look to the drawings of whichever muſeum you pleaſe, of Cheſſelden, Sandifort or Ruiſch, you will obſerve, that where the limb has been preſerved nearly of its natural length, the callus is very ſparing, and often the union of the neck of the bone has failed, the neck of the thigh bone has been entirely deſtroyed, and an unnatural joint formed; while on the contrary, a clumſy callus, or, as the older writers expreſs it, a profuſion of oſſific matter, is always connected with a ſhortening of the limb.

We may thus deduce the difficulties of this kind of fracture from cauſes very different, from the imperfection of our machines. We perceive that the fracture of the neck of the thigh bone muſt be deſperate in order to be cured. We are ſenſible that if the limb be but little ſhortened, and the broken bone ſurrounded only by its capſule, and very ſlightly lacerated, or not at all, the parts ſurrounding the broken bone being incapable of adheſion, unfit for the neceſſary proceſs of generating bone, the callus will be imperfect, the bones will continue to move upon each other, an unnatural joint will be formed, and there will be only a thickened capſule and condenſed cellular ſubſtance for the whole weight of the body to hang upon.

But if the limb be much ſhortened, and the fractured bone driven deep among the lacerated fleſh! out of the ſurrounding parts will be formed, a great vaſcular maſs. The bone will be thoroughly reunited, but with a very clumſy callus, which will cauſe lameneſs, as remarkable to others, though leſs weariſome or painful to the patient himſelf, as that where the unnatural joint is formed; for the limb is, in the caſe of a large callus, ſhorter and more awkward and more limited in its motions, but it is withal firmer, better ſupported, more hardy and uſeful. In ſhort, the whole ſubject draws itſelf naturally into this plain concluſion; in fracture of the neck of the thigh bone there will be either too big a callus, or none at all, and the perfect cure of this accident is almoſt impoſſible. If there be any truth in thoſe concluſions, the facts of pathology ſhould confirm them; nor can any ſubject of inquiry be more intereſting than the derangements of parts which have made thouſands lame and miſerable. Allow me, then, to explain to you as briefly as poſſible, the various conditions in which the fractured thigh bone is found upon diſſection.

1ſt, Where the capſule remains entire around the bones, this effect will generally follow: The action of the living powers in the two parts of the bone being unſupported by any continuity of veſſels, will ſoon ſubſide; the ends of the bone, in place of ſpreading out into broad ſurfaces, will ſhrink and become extenuated; it is ſaid, in ſuch caſe, that the neck and ſhaft of the bone are abſorbed! ſo they are, but they are continually abſorbed! During every moment of our exiſtence each part of the bony ſyſtem is in a ſtate of continual abſorption, and new parts are as continually depoſiting; it is only when the abſorbed parts are not replaced, or, in other words, when the veſſels of a bone fail to nouriſh it, that it ſhrinks and is waſted *. The upper part of the ſhaft of the bone then having loſt its continuity no longer retains its ſize, the neck entirely diſappears, the two ends of the bone become ſmall, are rounded off, are tipt with cartilage; the capſule ſtrengthens in proportion to the preſſure it ſuffers; the head of the thigh bone remains in the ſocket, its neck is in part or entirely abſorbed; the upper part of the bone, where the neck was broken, is covered over with cartilage, the joint which is formed is

* This the older ſurgeons aſcribed to friction: Hanc vetulam non ſolum claudicaſſe ad vitæ terminum verum etiam in cadaveris apertione inventum fuiſſe dicti oſſis collum in totum deficere et in nihilum adeo fuiſſe redactum ut nihilum quidem remanſerit Gerardus Borſt, chirurgus Amſteladomenſis ſatis expertus qui cadaver præſentibus variis medicis et chirurgis liberalitate ſua muſeum meum illo objecto adornavit.

Ruisch, p. 30.

imperfect, lame, and unſerviceable.—From ſuch a limb the body has no other ſupport than by the haunch bone hanging very uneaſily by the thickened capſule upon the top of the thigh bone.

This is very frequently the condition of old women, whoſe thigh bone being thin in the neck, is eaſily broken. The awkwardneſs of their clothes trips them, their fall is awkward, ſo as to break the cervix femoris, without puſhing it deep among the muſcles. This condition of the parts is known after the recovery of the patient, by the ſhortening of the limb, by a clucking noiſe when the bones move upon each other, like the crackling of the joints when twiſted (as in champooing the fingers), by the entire lameneſs, and by the frequent acceſſions of pain, for every joint ſo injured becomes rheumatic.

2d, When in conſequence of great violence the capſule is completely torn, the limb remarkably ſhortened, and the broken end of the thigh bone puſhed upwards among the muſcles, there is often a great maſſing of parts, and a large callus; but if the broken trochanters of the bone are puſhed far beyond the neck of the bone where it projects from the ſocket, if the broken part of the neck be oppoſed to the ſhaft low down where it is uninjured, no oſſification will take place, no connexion betwixt the neck and the ſhaft of the bone will be formed. The upper part of the broken thigh bone then reſts againſt the back of the haunch bone; it lies where the head of the thigh bone does in luxation, and obtains juſt ſuch a union as the luxated bone does. The haunch bone is fretted and inflamed, and begins to form a flat ſocket-like ſurface; the upper end of the thigh bone alſo flattens, and ſometimes enlarges, while the ſurrounding cellular ſubſtance condenſes into the form of a capſule. Such a limb hangs very high in air, it is much waſted for want of uſe, and entirely lame.

3d, When the upper broken part of the thigh bone (that broad ſurface I mean which is betwixt the two trochanters), is directly oppoſed to the broken neck, has a ſtrong diſpoſition to form callus, and yet is hindered by motion from uniting, and the friction keeps the vaſcular ſyſtem of both bones in an active ſtate; firſt, the head and neck of the thigh bone adhere with the ſocket, in which they remain, and form one maſs with it; that maſs gets a broad, flat, unequal ſurface; and that ſurface is oppoſed to a ſimilar one on the face of the thigh bone, betwixt the trochanters. Both ſurfaces (both that of the conjoined cervix and acetabulum, and that of the top of the thigh bone), are covered with cartilage; the inequalities of one bone correſpond with thoſe of the other, and by the help of the original capſule much thickened, together with condenſed cellular ſubſtance, a ſtrong

ligament is formed, and a flat and ſhuffling joint is completed, without the upper part of the bone being much diſplaced, or the limb much ſhortened, as it always is where the femur is lodged upon the back of the ilium.

4th, Even when the thigh bone is in the moſt favourable ſituation for a cure, when the capſule has been torn, when the capſule has entered with the other lacerated parts into inflammation, and has adhered to the bone, ſo as to ſupport its broken ends in contact with each other, the two ends are not regularly oppoſed, the neck of the bone remains in the ſocket, the broken part of the bone, which ſhould be oppoſed by it, is retracted by the force of the muſcles; the neck adheres, indeed, to the ſhaft of the bone, but it adheres with it at right angles; and the ſhortening of the limb, which is produced at firſt by the contraction of the muſcles, is perpetuated by the manner in which the broken pieces unite; in ſhort, the neck of the thigh bone ſliding down, as it were, lower upon the ſhaft, unites with it at right angles, and by loſing all its obliquity, loſes four inches of its length.

5th, But it is not alone by the abridgment of its length that the limb is curbed in its motions; the motions of the thigh are checked by two very ſingular cauſes. The length and obliquity of the neck of the thigh bone are chiefly deſigned for holding off the trochanters from the haunch bone, and are eſſential to the free motion of the joint; and conſequently when the obliquity and length of the neck of the thigh bone are loſt, when the neck, being almoſt deſtroyed, the head of the bone is united cloſe to the ſhaft at right angles, when the trochanter towers above the head of the bone, and is in actual contact with the haunch bone; when the trochanter is ſtill farther ſurmounted with a large irregular callus, and when the ſhaft of the bone lies flatter and cloſer upon the haunch bone, and rolls with ſmaller circles, the motions of the joint become ſhort and imperfect; the motion is, indeed, ſo checked, that the joint feels as ſtiff as if anchyloſed; and you are ſenſible, upon moving the joint, of the irregular callus chucking againſt the haunch bone. I have ſeen a young man in whom this chucking of the bones was very audible, and the joint, though not anchyloſed, was ſo curbed in its motions, that when he made a ſtep, in place of moving the limb, he advanced that ſide of the pelvis, and turned the trunk; the leg meanwhile being little ſhortened, not at all waſted, but firm and ſtrong.

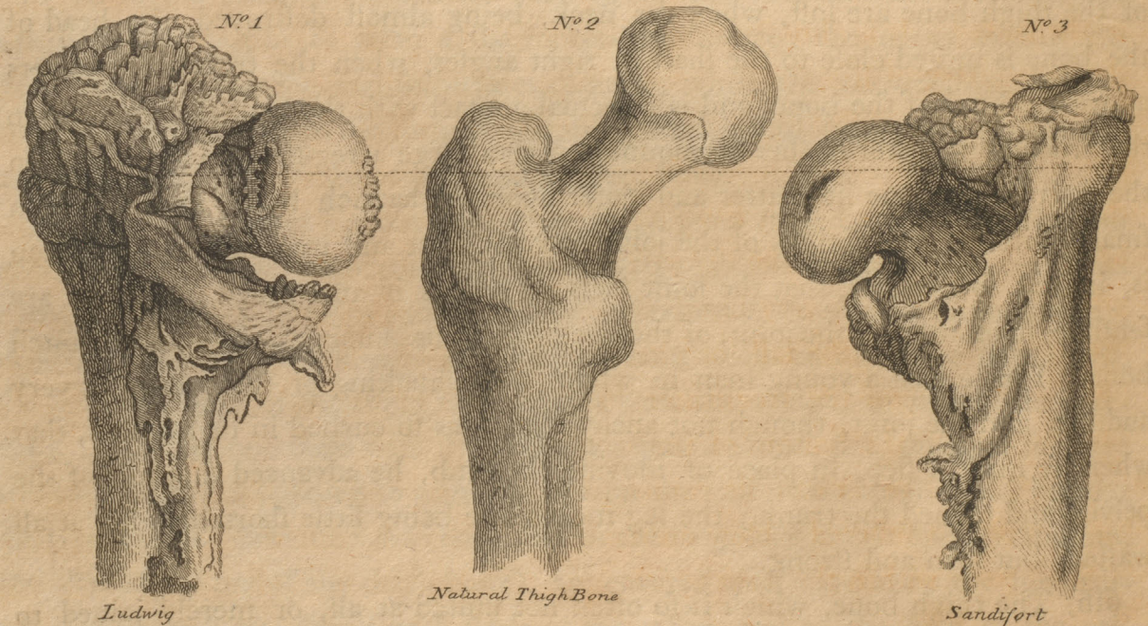
6th, The thigh bone, which is ſo often not united at all, or merely joined to the haunch bone by an unnatural and very imperfect joint, is frequently united with the pelvis immoveably by anchyloſis. Both bones (the trochanter and

the haunch bone), being hurt, both being in a diſpoſition to generate new bone, connected at the ſame time by the adheſion of the ſurrounding parts, and kept ſteady to avoid pain, unite with each other by a broad ſurface, by a perfect continuity of veſſels, they become as one bone; the joint, and even the ſocket, are entirely annihilated; the limb is in general remarkably ſhortened, hanging in the air, and waſted by want of uſe.

This may ſerve to explain ſome of the appearances of diſordered joints, and may ſerve as an outline or haſty ſketch of the pathology of the fractured thigh bone †.

† Theſe drawings explain abundantly well the conſequences of this depreſſion of the head of the thigh bone. We ſee plainly, upon comparing the two broken bones with the outlines of the ſound thigh bone, No. 2. placed betwixt them, how much the neck of the thigh bone, by loſing its obliquity, loſes of its length; how much alſo, as in fig. 1. from Ludwig (one of the earlieſt writers on this intereſting ſubject), the motions of the limb muſt be embarraſſed by the projection of the trochanter; and laſtly, it muſt be remembered, that often, as in No. 3. the head of the bone is not only ſet lower down, but turned round, with regard to the ſhaft of the bone, as is explained in the following note concerning the caſe: "Femoris oſſis ſiniſtri pars ſuperior eſt. Fractura colli adfuit obliqua, deorſum per partem corporis ſeſe extendens. Partes ſic concreverunt, ut caput loco admodum demiſſo conſpiciatur, et ſimul tantopere retrorſum receſſerit, ut eæ partes oſſis quæ ſano ſtatu a parte poſteriore inveniantur, nunc in parte *laterali externa dentur*."

SANDIFORT.

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## PATHOLOGY OF THE DISEASED ACETABULUM, OR AFFECTION OF THE SOFT PARTS WITHIN THE HIP JOINT.

Luxation of the thigh bone is uſually produced by a ſtrain or twiſting of the limb; fracture of the neck of the bone is uſually produced by perpendicular falls or leaps, in which one leg bearing, either directly or obliquely, the whole weight of the body, the ſtreſs falls upon the neck of the bone, which breaks acroſs: But the diſeaſe I am now to deſcribe proceeds from a fall upon the haunch (as when the foot ſlips on ice, &c.) in which the trochanter being directly ſtruck, the head of the thigh bone is beaten down into the ſocket, the round ligament, which occupies the bottom, and the mucous fringes, which are contained rather in the lower part of the ſocket, are violently bruiſed, whence ariſes immediate and very terrible pain, continuing for many months. The torture is excruciating, the patient cannot be turned, nor even moved, in the moſt gentle manner in bed; after, perhaps, a year's ſuffering, he begins to move about upon crutches, entirely lame.

This diſeaſe of the acetabulum is peculiarly frequent in people advanced in years. We muſt impute their ſufferings to the bruiſe of the ſoft and delicate parts which lubricate the joint. The conſequences are very deplorable, for it is from this cauſe that we ſee ſo many old people lame and miſerable for the remainder of their lives. It is almoſt peculiar to thoſe advanced in years, becauſe, during the active ſtage of life, the dangerous leaps and violent falls and ſtrains of the limbs more frequently diſlocate or fracture the bone; and in ſuch accidents, the head of the bone being driven upwards againſt the upper and deeper part of the ſocket, the mucus, ducts and ſoft parts which lie in the lower part of the ſocket, ſuffer no harm. But in old age, the ſlighteſt ſlip occaſions a fall, the fall is upon plain ground, yet the fall is very heavy for want of that agility and ſtrength that might break the force of the fall, or change its direction; the haunch is ſtruck, the blow is direct upon the trochanter, and the head of the bone is driven directly downwards into the bottom of the acetabulum †.

The diſorder never can be confounded with any other: No one who has in his own perſon ſuffered a blow on the knee or haunch, can doubt the ſenſibility of thoſe parts within the joint which ſerve to lubricate it; and no one who has

† From the awkwardneſs and entanglement of their clothes, ſuch accidents are peculiarly frequent with old women.

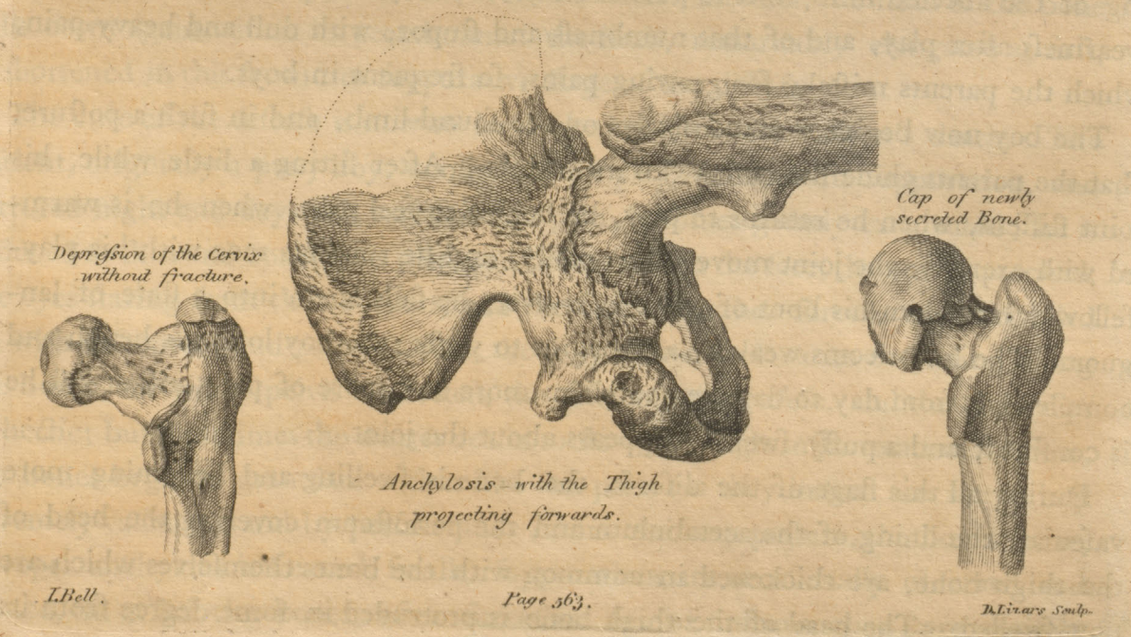
obſerved the number of large arteries which enter into the knee joint, for example, at its ſides or back part, or which enter into the hip joint under the ligament in the open part of the acetabulum, can doubt their vaſcularity or ſuſceptibility of action. This accident then is attended with excruciating pain, and is clearly diſtinguiſhed from fracture, becauſe there is neither crepitation nor ſhortening of the limb; from luxation, becauſe the limb turns eaſily; and from thoſe and all other affections by this, that though it turns eaſily, and there is no mechanical obſtruction to motion, the patient cannot ſuffer it to be turned, every motion of the head of the bone rolling againſt the injured parts of the ſocket producing delirious and frantic outcries. Sometimes this inflammation of the joint ſubſides, and after long confinement and torture, perhaps after uſing warm baths, frequenting watering places, fomenting and gradually exerciſing the joint, the patient recovers the uſe of his limb; but much more frequently he continues lame.

It is not difficult to imagine, and indeed to prove by diſſection, various changes by which the joint is deſtroyed. The firſt effect of ſuch inflammation and inſufferable pain is, to produce a trembling ſolicitude on the part of the patient to prevent the ſlighteſt motion of the limb. The patient lies in all the filthineſs of a ſickbed, will not permit a pillow to be changed, or a ſheet to be rolled under him; even the trembling of the floor, when people walk rudely, increaſes his irritability, if not his actual torture. This is almoſt like a proviſion of Nature, for motion actually does harm, excites inflammation, brings the inflammation forward to abſceſs of the joint and caries of the bones, and prevents anchyloſis, which is often the only poſſible cure; the preſumptuous interference of quacks with the proceſs of Nature, their daring to twiſt and turn ſuch a limb, under the pretext of reducing luxation, has actually proved fatal.

The ſtillneſs of the patient, like death, and the uniform poſture for many months, favours all thoſe changes which are apt to take place in a joint thus highly inflamed. Sometimes the inflammation ſtops ſhort of ulceration, the capſule, tendons and membranes ſurrounding the joint, are merely thickened by the inflammation, and the joint remains ſtiff, rheumatic, but moveable, and, as far as pain will allow, uſeful. Sometimes, and eſpecially in younger people, the inflammation runs high, abſceſs forms, and after repeated paroxyſms of inflammation and moſt excruciating torture, the matter burſts out at the haunch or in the groin, with proportioned relief of pain. Often, you may ſuppoſe, before the matter thus burſts out, the bones themſelves are ulcerated, the capſule is deſtroyed, the head

of the bone is extruded from the acetabulum, and retracted by the force of its muſcles upon the back of the haunch bone; then the leg is ſhortened; and this is what the ancients called Subluxation, the French, Luxation Conſecutif, and which has been by almoſt all ſurgeons acknowledged as a luxation under the title of Luxation from an Internal Cauſe. Often the bones, thus eroded, become carious, and not unfrequently hectic enſues, and the patient dies.

If, eſcaping all thoſe dangers, the patient live, and the bones granulate, they unite with each other; for the perſevering poſture of the patient prevents the proceſs of oſſification being diſturbed, more effectually than our moſt ſevere and curious bandages could do; the bones unite with each other often in the moſt awkward direction, the thigh bone being fixed and united with the pelvis at right angles in reſpect to the body. But even although the bones be not entirely eroded, I obſerve a very ſingular conſequence to reſult frequently from the mere inflammation of the perioſteum and bones, and it is this; the bones thicken, there is a ſort of exoſtoſis, but flat and regular, a new lamella of bone is ſecreted under the perioſteum! and you will often ſee, in muſeums, the head, for example, of the thigh bone covered, as it were, with a cap of newly-ſecreted bone projecting over the neck, and almoſt touching the trochanter; indeed it does not ſeem to me that any thing is neceſſary to this regular and almoſt natural generation of bone but a ſlight degree of inflammation, and a fixed poſture of the limb.



Once more let me obſerve, that I aſcribe this diſeaſe to old people, becauſe they are ſubject to thoſe awkward falls in which the great trochanter is ſtruck; but let it be remembered, that ſometimes in the aged the bone is broken, though very ſeldom luxated, by this blow. I alſo diſtinguiſh this as a diſeaſe of thoſe advanced in years, becauſe the aged are not liable to a peculiar diſeaſe of the bones themſelves, which I ſhall now deſcribe.

## OF THE SCROPHULOUS DISEASE OF BOYS, OR THE DISEASE OF THE BONES WHICH COMPOSE THE HIP JOINT.

The ſcrophulous diſeaſe of this joint is peculiarly frequent in boys from five to eighteen or twenty years of age, and is of that inſidious nature, that its approach is hardly obſerved; the diſeaſe is eſtabliſhed before its ſymptoms are noticed, even by the moſt affectionate and attentive parents, and it ends in total caries of the joint, with anchyloſis or coheſion of the diſeaſed bones, though often, from the ſuppurations and dreadful pain, hectic and death prevent this imperfect cure. The bones, and not the ſoft parts, are the ſeat of the diſeaſe, therefore its progreſs is very ſlow; the pain is ſo dull, that the boy walks and runs about for months after the diſeaſe is formed. The parents firſt obſerve an awkwardneſs and trailing of the affected limb, as if it were weakly; the boy complains little except of wearineſs after play, and of that numbneſs and ſtupor, with dull and heavy pain, which the parents miſtake for growing pains, ſo frequent in boys.

The boy now begins to ſtand always on the ſound limb, and in ſuch a poſture, that the parents chide him for awkward habits. After ſitting a little while, his joint ſtiffens, when he returns to play, he begins to feel pain, when he is warmed with exerciſe, the joint moves more eaſily, and he runs his race with his playfellows! but when his bout of exerciſe is over, he falls again into a ſtate of languor. The limb ſeems weakly, and begins to waſte, the boy loſes his health and complexion, from day to day he complains more and more of pain, till at laſt he is confined, and a puffy ſwelling appears about the joint.

During all this ſtage of the diſeaſe, the bone is ſwelling and becoming more vaſcular, the lining of the acetabulum and the perioſteum covering the head of the thigh bone, are thickened in common with the bones themſelves which are now ſwelled. The head of the thigh bone is protruded in ſome degree from its

ſocket, juſt as a diſeaſed tooth is protruded from its ſocket by a bag of ſuppuration forming under its fangs, by which the tooth is not only apparently but actually longer than the adjoining teeth. Still the diſeaſe is limited to the bones; there is not, as in the diſeaſe ariſing from bruiſes of the acetabulum, excruciating acute pain! although the leg be remarkably elongated ſo as to ſtraddle away from the body, though it be ſo elongated that when the boy ſtands on the diſeaſed leg the toes only of the ſound one touch the ground, yet he is almoſt without pain, and walks with a degree of eaſe! exerciſe, or the common degree of motion, during this ſtage, is not ſo difficult on account of pain, as imprudent, from its increaſing that affection of the bones which unhappily is too late of declaring itſelf by acute pain.

But at laſt the ſtage of acute pain does come; the boy becomes unable to move, the pain becomes very acute, the ſoft parts which connect the bones begin to partake of the inflammation; there is redneſs now, as well as ſwelling, round the haunch. The pain is often, though not always, excruciating; abſceſſes form round the joint; the matter burſts out, firſt at the groin, then at the hip! as the abſceſſes give vent to the matter, the torture is in ſome degree relieved, as one ſinus or ulcer dries or cloſes up, another runs more plentifully, or new abſceſſes form. Then the cartilages are ulcerated, the matter which had diſtended the capſule is evacuated, and the ſwelling of the parts within the acetabulum, which had in ſome degree extruded the head of the bone from its ſocket, ſubſides, the head of the bone falls down again within its acetabulum! the limb, remarkably elongated at firſt, is ſhortened in this ſecond or ſuppurative ſtage of the diſeaſe.

The cure of the diſeaſe is now to be looked for, or the patient's death. The patient, originally a puny boy, confined from play, waſted with ſuppuration, and tortured night and day with excruciating pain, becomes greatly extenuated; he is reduced to ſkin and bone, he is pale, and cadaverous in the face, the noſe is pinched, the eyes ſtaring from their ſockets, and the face altogether ſhrunk and ſhrivelled up with diſcontent and pain. Often, the ſuppuration and caries extending along the bones, the whole pelvis is affected, the diſcharge is profuſe, and the child dies of hectic; but ſometimes the matter ceaſes to flow, the high inflammation ſubſides, the bones begin to granulate within like ſoft parts (as they indeed are in the boy extremely vaſcular), and by perſeverance in one uniform poſture, the bones unite, a proper anchyloſis is formed, ſmaller ſuppurations are occaſionally obſerved and opened, till at laſt the bones, after ſucceſſive fits of inflammation, are entirely

united with each other. The thigh bone is generally united with the haunch bone at an angle more or leſs acute, according to the poſture which the child had found the moſt eaſy; frequently it is found, when the boy begins to walk with his crutch, that the thigh protrudes forwards; ſometimes it is in the natural direction of the body, but even then the limb hangs in air, it is extenuated by want of exerciſe and by diſeaſe; the diſeaſed limb has been ſtationary in its growth for eighteen months or two years, while the other limb and the reſt of the body has been growing; thence the affected limb is always ſhortened, and often uſeleſs.

This is the ſhort and ſimple deſcription of a melancholy and frequent diſeaſe, the chief peculiarities of which, as ariſing from the peculiar conformation of this joint, fall next to be explained.

In ſuch a diſeaſe parents would fain deceive you, often they deceive themſelves; it never is aſcribed to any conſtitutional affection, but to a fall or blow in a rambling ſchoolboy, or, in a younger child, to the careleſſneſs of a nurſe. This is a mere deception; the curvature of the ſpine, for example, is always aſcribed to ſome blow or fall, the ſpine bends outwards, one of the vertebræ becomes pointed, a particular tumor appears, it is very natural for the parents to imagine that this has been occaſioned by a blow, and to accuſe the nurſe! but the ſurgeon knows that the curvature of the ſpine is an internal and a conſtitutional diſeaſe; it is an ulcer ſucceeded by a caries of the vertebræ; it is the body of the vertebræ (not of one indeed, but of ſeveral vertebræ) that is affected; the intervertebral ſubſtance and the ligaments are ulcerated, the bone itſelf is carious, the waſting of the vertebræ on their fore part makes them fall nearer each other, and it is becauſe the vertebræ are ſound behind that they preſerve their natural ſize, and bulge outwards, while the bodies of the vertebræ are ulcerated within. Thus a diſeaſe is uſually aſcribed by parents to a blow, which we know by innumerable diſſections is actually produced by an internal ulcer, the ſurface of the bone ſuppoſed to be ſtruck is in fact the only part remaining ſound. What rambling ſchoolboy can eſcape blows and falls? yet the moſt deſperate blows are followed by no ill conſequence, except in thoſe prediſpoſed to diſeaſe.

Diſeaſes of the bones and joints then are peculiar to boys of a ſcrophulous conſtitution; to boys who have a fair complexion, grey eyes, light hair, and a tranſparent redneſs of cheek; a ſwelled mouth, and puffy face, a large head, a tumid belly, clumſy limbs, with ſoft fleſh which feels like wool; for ſcrophulous boys, when not under actual diſeaſe (then they become ſhrunk and pale) have a big

and fleſhy body, and roſy countenance, which any uninformed perſon would miſtake for marks of uncommon health and vigour.

This indeſcribable whole, which the phyſician eaſily diſtinguiſhes, indicates a lax and weakly ſyſtem, the foundation of many diſeaſes; the bowels and glands are eſpecially apt to ſuffer, but the bones moſt of all. The ſcrophulous habit ſeems to conſiſt in laxneſs and debility, in an imperfect action of the arteries, in an imperfect ſecretion of the ſolids, and eſpecially in an imperfect ſecretion of the bony matter; for in all ſtages of life, but eſpecially while the bones are a-forming, the bones ſuffer in various ways by this diſeaſe, which appears ſometimes in the form of rickets, in which the ſecretion through the bony ſyſtem, being imperfect, the bones bend, and are diſtorted, under the weight of the body; ſometimes under the form of necroſis, in which the whole ſhaft of a bone dies, and is expelled through the abſceſs which its death occaſions, while by the activity of the ſurrounding parts a new bone is forming, the dead being diſcharged piecemeal; and very often the general diſeaſe ſhows itſelf in affections of the great joints. Such as we are now explaining.

You will obſerve, I ſay, the "great joints," by particular deſign, for they only are affected. It is not from a blow or fall that the ſcrophulous diſeaſe proceeds, elſe we ſhould eaſily trace it to its cauſe! it could indeed be no equivocal blow that could produce ſuch a diſeaſe! we ſhould find the diſeaſe as frequently in the wriſt, the elbow, the ſhoulder, as in the joints of the lower extremity. But it may be that the diſeaſe is peculiar to the articulations of the lower extremity, becauſe they ſupport the whole weight of the body? No, for the ancle is rarely diſeaſed, though it bears more weight than the hip or knee, and is fully as liable to twiſts, ſprains, and blows. It may ariſe then from the injury or diſeaſe of the ſoft parts, ſince thoſe joints are very complicated? No! for fractures, luxations, even bruiſes of the acetabulum, do not, either in adults or in healthy boys, produce diſeaſe.

This is plainly a diſeaſe, and a ſlow diſeaſe of the bones; it is a diſeaſe of boys, becauſe in them the bones are but forming; it is a diſeaſe of ſcrophulous boys, becauſe in that ſtate of the ſyſtem oſſification is a ſlow and imperfect proceſs; it is a diſeaſe peculiar to the bones of the great joints, becauſe they are large, and are till the twentieth year very imperfectly formed.

The joints peculiarly ſubject to ſcrophulous affections are the ſpine, the hip, the knee. The KNEE is diſeaſed leſs frequently, becauſe, though it bear all the load,

and be in continual motion; though its bones, eſpecially the heads of the tibia and thigh bone, be large and ſomewhat ſpongy, they are yet completed pretty early in life, and are comparatively firm and compact. The HIP is very ſubject to diſeaſe, becauſe its acetabulum is formed in the centre of three of the largeſt and moſt ſpongy bones in the body, the joining of which is exactly in the centre of the acetabulum, and remains actually cartilaginous till the twentieth year. There is in the pelvis a great maſs of bone to form, and it ſeems that till years of manhood it remains very imperfect; now, it is neither in the ſoft parts, in the central ligament, nor in the thigh bone, that the diſeaſe begins, but in this acetabulum *. The DISEASE OF THE SPINE is the moſt frequent of all, becauſe the ſpine, while it ſupports the whole weight of the body, turns with the ſlighteſt inclination of the trunk, and conſiſts of the moſt ſpongy bones, and it is in the moſt ſpongy part of theſe bones, in the fore part or body of the vertebræ, in that part in which the church-yard bone ſeems ſo porous, and which in the living body is almoſt as vaſcular as fleſh, that this diſeaſe begins; and the matter making its way from the carious vertebræ along the looſe cellular ſubſtance at the loins, appears at laſt at the groin forming the lumbar abſceſs; for the lumbar abſceſs is the ſame diſeaſe with caries of the ſpine.

The joints of the vertebræ, the knee, the hip, as they are the largeſt and bear the the whole weight of the body, are the moſt complicated with ligaments and lubricating apparatus, ſo that by being the ſtrongeſt in the actual form of their bones and muſcles, they have a peculiar delicacy of conſtitution, and are the moſt ſuſceptible of diſeaſe. Upon thoſe three joints then does the whole force (if I may ſo expreſs myſelf) of this diſeaſe fall.

1ſt, That this is a diſeaſe of the bones, we are well aſſured from the lingering

* I have reaſon to believe, that often the acetabulum being entirely deſtroyed, the head of the thigh bone ſtill entire paſſes through the hole up to that point at which it is naturally ſtopped by the trochanters. Ludwig, not obſerving how very liable this part is to diſeaſe, nor indeed perfectly acquainted with the ſcrophulous caries of the hip joint, imagined, that ſometimes the head of the thigh bone, by the force of a fall upon the trochanter, was driven through the centre of the ſocket at the place where the bones are joined by their intermediate cartilage; but I ſhall ſpare my conjectures, and enable you to make your own, by laying before you the text of Ludwig. "Aliter quam hoc in caſu violentior impetus, femoris collo et acetabulo in puero novem circiter annorum illatus articulum mutavit. Oſſa coxarum quæ *nondum coaluerant in illatæ facile cedebant* et ilium non nihil antrorſum et introrſum flexum inveniebatur," &c. But the whole deſcription of the caſe correſponds with a diſeaſe which I ſhall deſcribe preſently, viz. the ſcrophulous caries of the hip joint, for the head of the thigh bone had coaleſced with the acetabulum, &c.

nature of the diſeaſe, the little pain with which its firſt ſtage is attended, the period of life at which it occurs, and from boys and parents miſtaking it for growing pains, for I have examined thoſe carefully who have the mollities oſſium, or the necroſis of the long bones, diſeaſes which are always deſcribed by the patients as "dull and heavy pains of rheumatiſms in the bone."

2d, The pains are dull becauſe the bone is inſenſible, the diſeaſe ſlow becauſe the firm ſyſtem of a bone does not eaſily enter into diſeaſe; the elongation of the joint is a ſure ſign that the diſeaſe is eſtabliſhed, and the head of the bone, the ſocket and the ſoft parts beginning to ſwell; the excruciating pain demonſtrates that the ſoft parts are fully inflamed and ulcerated, and that to the original diſeaſe of the bone is now added a diſeaſe of the ſurfaces, ſuch as takes place after the bruiſe of the acetabulum; and finally, the ſhortening of the limb intimates to us that the bones are waſting, which is often confirmed by ſmall fragments and ſcales of bone coming away along with the matter. Finally, When the matter ceaſes to flow, the fiſtulas to cloſe, the limb to ſhorten ſtill more, and the pains to ſubſide, then the bones come into actual contact, granulate, unite, and anchyloſe firmly in due time, for the hectic ceaſes, the appetite returns, and the cure goes on well, if only the patient can ſurvive the degree of debility already incurred.

3d, This final deſtruction of the joint is the ordinary iſſue of the diſeaſe, for where the bones are once thoroughly diſeaſed, they are in general carious, or in other terms, dead, or (as we ſhould ſay of ſoft parts) gangrenous to ſome extent. The carious part then muſt be ſeparated; the bones which enter ſo ſlowly into diſeaſe, muſt of courſe recover ſlowly; but beſides the extent of ſurface, the diſeaſe is attended in its firſt ſtage with ſo little pain, the patient walks ſo long while the diſeaſe is forming, and the joint bears ſo entirely the whole weight of the body, that being once diſeaſed it cannot eaſily recover; it is indeed entirely ruined in its ſtructure almoſt before the diſeaſe is obſerved.

4th, The cure in the bruiſe of the acetabulum is leeches, fomentations, bliſters, general bleeding, and perfect quiet; but in this ſcrophulous diſeaſe of boys, the cure is beſt conducted by cold bathing, generous food, wine, and whatever will contribute to the reſtoration of the health and ſtrength. The immediate progreſs of the diſeaſe is beſt antagonized by the counter irritation of bliſters, or rather of deep and large iſſues upon the hip, or by the application of cauteries (the oldeſt and perhaps the beſt method of cure), along with prudent openings,

and careful but unofficious ſurgery. But the object of chief importance in promoting the anchyloſis, is to prevent motion, for even the weight of the limb is very painful, the very turning in bed inflames the part and interrupts the proceſs; and quacks, by turning and twiſting joints during this proceſs (the patient being in a fair way of being cured), have cauſed death.

5th, When the diſeaſe cannot be prevented from going on to the ſuppurative ſtage, the conſequences are, abſceſs of the joint, hectic fever, burſting outwardly of various abſceſſes and unavoidable ANCHYLOSIS. But let it not be ſuppoſed that anchyloſis is the peculiar conſequence of this diſeaſe, it proceeds occaſionally from every affection of the joint, and ſometimes even exiſts independent of diſeaſe. It is produced ſometimes by luxation, the head of the thigh bone being placed upon the back of the haunch bone, the nouriſhing membranes of both bones lacerated and excited to granulate, and the bone being kept ſteady in this unnatural poſture from fear of pain. Sometimes anchyloſis is produced by fracture, the broken neck of the thigh bone being lodged cloſe upon the back of the haunch bone among the lacerated parts. Sometimes it is produced by the bruiſe of the acetabulum, followed with inflammation, pain, and ulceration within. And ſometimes anchyloſis proceeds merely from the uniform poſture of the limb when it is fixed by any other diſeaſe! I am indeed perſuaded, that if we had legs and ancles to thoſe thigh bones which we have in our muſeums, we ſhould not unfrequently find the cauſe of anchyloſis in the hip joint to have been a diſeaſe in ſome lower part of the limb. Still it muſt be acknowledged, that this ſcrophulous diſeaſe is by far the moſt frequent cauſe of anchyloſis. We perceive then that the effects of diſeaſe upon this joint are never limited by the firſt cauſe, that the effects of diſeaſe are very irregular; that the ſurgeon cannot know what is going on within, without being acquainted with every poſſible affection of the joint †.

6th, During all this proceſs, there is not that ſubluxation, that diſplacement of the head of the bone from an internal cauſe, which was ſuppoſed; there is never

† In the following paſſage we perceive that Petit, without underſtanding this proceſs, had ſeen it often: "J'ai trouvé, dans l'ouverture d'un ſemblable abcès, que les os étoient *carnifiés*; je veux dire que la tête du fémur et la cavité de l'iſchion, éloignées l'une de l'autre par la luxation, mais toutes deux découvertes par l'ouverture de l'abcès, avoient la même conſiſtance et la même couleur que la chair. Le volume de ces os étoit conſidérablement augmenté, et ils étoient *ſi ſemblables à la chair qu'ils ſaignoient au moindre attouchement*. Cette obſervation *n'eſt pas la ſeule que j'aie de cette eſpéce*, j'en rapporterai, dans le ſuite, pluſieurs qui ne ſont pas moins ſurprenantes; et qui *prouvent que ſi les chairs s'oſſifient, les os peuvent auſſi devenir ſemblables aux chairs.*"

that entire diſplacement which Mr. Petit ſuppoſed, when he aſſerted that the head of the bone falling into the ſciatic notch preſſed there upon the ſacro-ſciatic nerve, and produced paralyſis by the preſſure †. Petit formed a very ingenious theory to explain how the head of the thigh bone might be retracted ſo as to ſhorten the limb without being diſplaced from its ſocket, whereas he ſhould have been employed in explaining how the thigh bone can be elongated, without the head of the bone being in any ſhape diſplaced either by being retracted or by being extruded from its ſocket; for we now perfectly know, that during that period of the diſeaſe in which the limb is elongated, the head of the bone actually never is luxated, it is right and fair in its ſocket, though both the head of the bone and the ſocket are ſwelled; it is indeed ſo fairly within its ſocket, that at the very time of its greateſt elongation, when the toes of the ſound leg can hardly touch the ground, the patient walks, and that pretty firmly too, upon the lengthened limb.

7th, When the period of ulceration, granulation, and healing of the bones arrives, a remarkable, but very gradual, ſhortening of the limb takes place, becauſe the bones muſt firſt be ulcerated, then fall into cloſer contact, then granulate, and then adhere, before the anchyloſis is complete. During the whole of this proceſs the parts are waſting, coming cloſer and uniting, at leaſt it moſt generally is ſo. I obſerve in anchyloſis, even of the knee joint, where the bones are flat and the cartilages remarkably thin, that there is a very remarkable ſhortening of the limb.

8th, When ſuch a ſuppuration and caries, beginning in the bones themſelves, does happen, not in boys, but in adults, not from any conſtitutional diſeaſe, but from a blow, the blow is in a very particular direction, and affects only the bone; for it is not a blow upon the trochanter ſtriking the head of the bone downwards, ſo as to bruiſe the ſoft parts at the bottom of the acetabulum; but it is by a perſon making a deſperate leap and lighting fair upon the feet, for the head of the thigh bone is then ſtruck upwards againſt the deepeſt part of the acetabulum, where the Os Innominatum is particularly large and firm! the bone only is bruiſed, there is no immediate pain, the lameneſs comes on ſlowly, the diſeaſe uſually makes that ſlow progreſs which is deſcribed in the caſe related in the foot note from the Poſthumous Works of Juſtamond ‡.

† La paralyſie eſt cauſée par la compreſſion du nerf ſciatique, lorſque la tête du fémur y appuïe. La maigreur et l'exténuation de tout le membre, un froid preſque continuel, en ſont les ſuites.

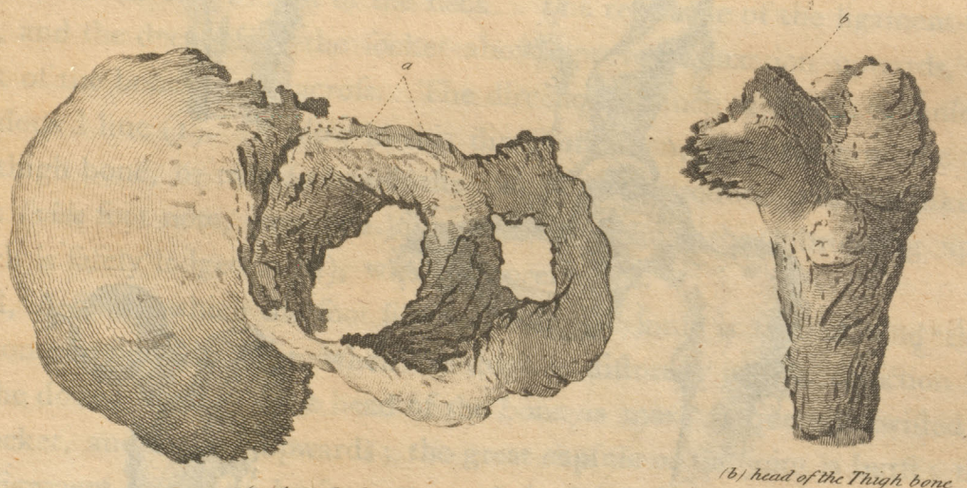
‡ A woman about eight-and-twenty years of age, laden with a baſket full of bottles, *having jumped down a few ſtairs in going into a cellar, preſerved the centre of gravity* of the upper parts upon the left thigh and leg

Conclusion.—This then is a diſeaſe which has been known in all ages and in all climates, and authors have from time to time noticed it, but not with that fixed attention which ſo important a matter deſerves. The older authors may have been inaccurate in names, and (what is more to be lamented) careleſs of thoſe diſtinctions which are ſo neceſſary and uſeful in practice; but the phenomena of a diſeaſe ſo very remarkable as this could not eſcape their obſervation. This is the conſecutive or ſecondary luxation of the French authors; and when the celebrated Sabattier proceeding to deſcribe the conſecutive luxation begins thus, "I was conſulted for a girl of thirteen years of age;" we are ſenſible even by this, that he is going to deſcribe a ſcrophulous diſeaſe of the hip joint, and his deſcription confirms the ſuſpicion raiſed by the tender age of his patient. The celebrated Petit, who was indeed the firſt who deſcribed this diſeaſe with accuracy, is in fact employed in writing an elaborate eſſay on the hip diſeaſe without knowing it. In ſhort, the French ſurgeons, from their looſe and vague manner of writing, introduced great confuſion into this department of pathology; they firſt confounded luxation with the bruiſe of the acetabulum, which

ſo well, that *ſhe kept herſelf from falling*; but ſhe experienced, in the inſide of the joint of the hip, *a violent ſhock*, which was, however, attended *only with a very bearable degree of pain*, ſince ſhe was able to continue her ordinary work for more than a fortnight, *without complaining*. But ſhe ſtill felt, in walking, a pain which *gradually increaſed*, from the continual exerciſe ſhe was obliged to uſe in her capacity of ſervant: the difficulty of motion increaſed with the pain; and both the one and the other, *three months after the accident*, were grown ſo much worſe, that the woman was no longer able to ſupport herſelf upon that limb. At this period ſhe came into the hoſpital where I attended; different embrocations were uſed to the upper part of the thigh, but without any effect; reſolutive, anodyne, and maturating cataplaſms were then applied, becauſe a tumor manifeſted itſelf at the upper poſterior, and external part of the thigh, which ſeemed tending to ſuppuration. A fever came on; and when the abſceſs became evident, all the openings and counter-openings were made, which the ſinuſes the pus had formed, required; the matter which came out, had no kind of offenſive ſmell: it brought away along with it ſome ſmall bony particles, and an oleaginous fluid floated on the ſurface; the inciſions were lengthened as much as it was thought neceſſary, ſetons were paſſed, and during the courſe of the treatment, vulnerary and deterſive injections were tried, ſuch as were imagined to be beſt ſuited to the ſtate of the parts. At different intervals ſmall portions of bone came away, ſeparated either from the head of the thigh bone, or from the cavity of the joint, into which ſeveral of the ſinuſes penetrated. A ſlow fever and a maraſmus, which is its uſual attendant, deſtroyed the patient between three and four months after her admiſſion into the hoſpital. Upon examining the ſeat of the diſeaſe, I found the capſular ligament almoſt deſtroyed, the round ligament totally conſumed, *the head of the thigh bone carious in all its ſurface, and even to a conſiderable depth in its centre; the cavity of the joint was alſo attacked with caries throughout its whole extent; and laſtly, its cartilaginous border was completely deſtroyed.*

they deſcribed as a conſecutive luxation; and they next confounded this bruiſe of the acetabulum or conſecutive luxation with the ſcrophulous diſeaſe of boys. This hip joint diſeaſe is the ATROPHIA poſt ICHOREM et MELICERIAM acrem articulorum exulceratorum, of Hildanus, whoſe deſcription of the conſequences of this diſeaſe, and of the manner in which the joint becomes anchyloſed, is curious and accurate: "Ichor enim ille, qui ex toto corpore ad articulum vulneratum fluit, primo ligamenta et vincula, quæ articulum cingunt, deinde cartilagines etiam, quibus junctura incruſtata eſt, erodit et abſumit. Hinc fit, ut oſſa à ſuis cartilaginibus et vinculis denudata, inter ſe callum (quod ante me nullus, quod ſciam, obſervavit) tam firmiter coaleſcant, *ac ſi nunquam ea in parte fuit articulus.* Hoc multis paradoxum eſſe videbitur; ego vero expertus loquor." In ſhort, he was the firſt that obſerved this diſeaſe.

*Deſtruction produced by the Scrophulous Diſeaſe of the Hip-joint*




*(a) Acetabulum deſtroyed*

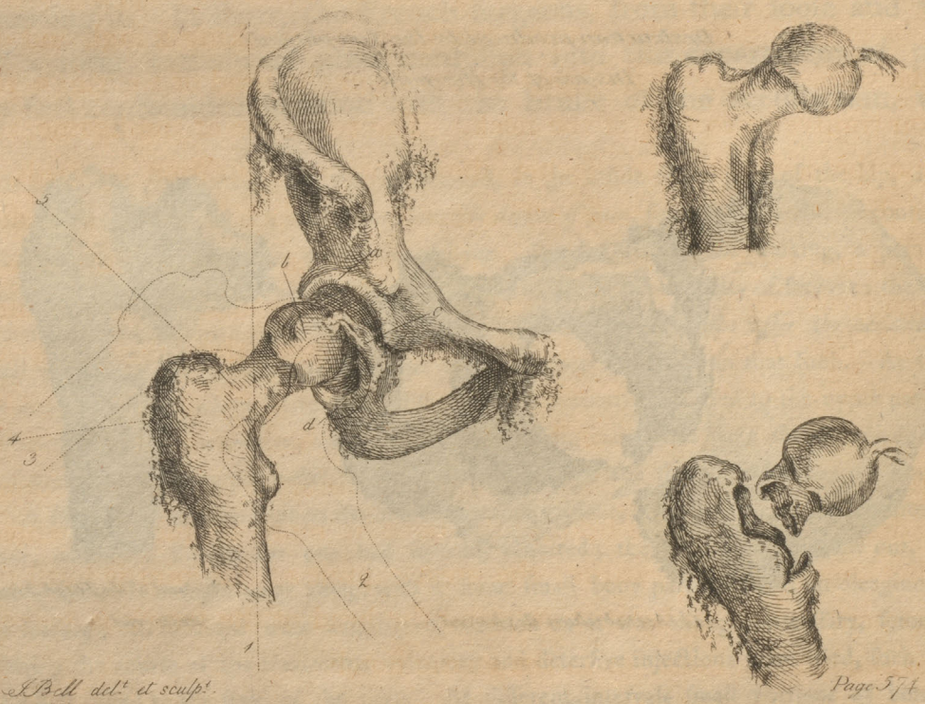
*(b) head of the Thigh bone deſtroyed*

*Ford* D.Lizars.ſculp[t] *Page 573.*

## DIAGNOSIS OF THE VARIOUS ACCIDENTS AND DISEASES OF THE HIP JOINT.

In diſtinguiſhing the various affections of the hip joint, we can truſt nothing to the opinions of the older ſurgeons, ſo entirely unacquainted with the ſcrophulous diſeaſe, and ſo inaccurate in their diſtinctions of all the other affections of

the joint; this I have already hinted, and ſhall now have occaſion to prove. Nor is it indeed by authority and the facts of others that we ſhould be guided in the practice of our profeſſion, but rather by reaſon, by our knowledge of the ſtructure of the parts, and in the preſent caſe, by obſerving the various diſtortions and ſhortenings of the limb; for it will be found, that from the peculiar ſtructure of the hip joint, certain accidents will produce invariable appearances, and luxation, fracture, or injury of the acetabulum, will give infallible ſigns of diſtinction by the peculiar diſtortions of the limb. I well know how difficult it is to remember correctly the forms of any internal part, and how much more difficult it is to apply ſuch anatomy to the peculiar circumſtances of each caſe; how impoſſible it is to reaſon upon luxations and fractures as abſtract ſubjects, without ſome ſenſible repreſentation of the facts; it is for this reaſon that I think it adviſable to accompany each difficult point of the diagnoſis with a ſimple plan.




The firſt plan that I lay before you, is ſuch a ſcheme of the hip joint as will explain decidedly the effects of blows or falls in various directions. (a) Marks the deepeſt part of the ſocket which entirely receives the round head of the thigh bone, and upon this point the whole weight of the body reſts. (b) Next marks the head of the thigh bone raiſed and turned a very little out of its acetabulum, in order to ſhow the hollow of the acetabulum and the root of the round ligament. (c) Marks the round ligament which ariſes rather from the lower mar-

gin of the ſocket, and which prevents the head from ſtarting out of the ſocket, or being at all luxated till this ligament is burſt; and indeed it would ſeem as if the weight of the body were in ſome degree ſupported by this ſtrong ligament, though the weight is chiefly balanced upon the head of the thigh bone. (d) Marks that deep part of the ſocket where the mucous ducts and fatty fimbriæ lie, and where the inſide lining of the capſule is moſt peculiarly delicate; and ſince the body hangs by the upper part of the ſocket on the top of the thigh bone, this delicate apparatus, lurking in a ſmall dimple at the lower part of the ſocket, eſcapes all dangerous preſſure, and is but gently moved as the central ligament moves.

With the plan of the joint thus before us, nothing is more eaſy than to judge, with almoſt mathematical preciſion, of the effects of each particular blow or twiſt. 1ſt, In the perpendicular poſture of the body, when the pelvis reſts fairly on the head of the thigh bone, the neck of the thigh bone bears its full ſhare of the weight; and in falling from a height upon the feet, or in dropping from a window †, or in falling with force upon one knee, or in taking a high and dangerous leap, the whole weight of the body ſtrikes upon the head of the thigh bone in a direction tranſverſe to that of the neck. The reſiſtance of the ligament from below, and the deepneſs of the ſocket above, prevents luxation upwards, and the neck of the bone breaks acroſs. The direction of ſuch a ſhock is indicated by the dotted line (1). A blow in this direction, then, may fracture the neck of the thigh bone, or may ſo bruiſe the ſocket, as to produce a diſeaſe like that of boys (*vide* foot note, page 572.) but can never hurt the lubricating apparatus, which is ſafely lodged at (d), where no preſſure is.

2d, A fall in which the foot ſlips inwards, the limb is twiſted, and the body falls on one ſide; in ſhort, when the thigh is diſtorted in the direction marked by the dotted line (2); the head of the bone is more frequently twiſted out of its ſocket, and luxated upwards; the great capſule of the joint is burſt; the central ligament is torn up by its root; and the head of the femur is lodged on the back of the haunch bone, or in the ſciatic notch.

† "Voici ce que j'ai vû. Un homme voulant deſcendre d'une feneſtre un peu haute, ſe gliſſa le long du mur, le dos tourné du côté de la ruë, et ſe tenant ſur le bord de la feneſtre avec les mains, lorſqu'il ſe fut allongé pour approcher, autant qu'il le pouvoit du pavé, et tomber de moins haut, il lâcha ſes deux mains, et tomba à terre ſur la plante des deux pieds, mais inégalement. Le pied droit porta le premier, et ſouffrit tout le poids du corps, dont la force étoit multipliée par la vîteſſe de la chûte. Le pied, la jambe et le corps du fémur réſiſterent, parce que la ligne de direction du poids du corps tomboit perpendiculairement deſſus; mais le col du fémur, par la raiſon contraire, ſe caſſa à cauſe de ſon obliquité."

3d, But when the perſon ſlips his foot, ſo that the inſide of the ancle ſlides along the ground, and that the limb is twiſted outwards; or when having a heavy burden on his back, he falls, ſo that the inſide of the knee ſtrikes the ground; or when, as in laying a ſack of corn from his back upon a cart, he makes one ſtep away from the cart, and the ſack falls upon his extended leg, ſo as to twiſt the limb outwards; then the thigh bone comes into the direction denoted by the dotted line (3), the head of the thigh bone is turned downwards towards the lower part of the ſocket, and is eaſily luxated in that direction, becauſe there the ſocket is imperfect, its border is low and guarded only by a ligament (the ligamentum labri cartaliginei), while the central ligament prevents only luxation upwards, becauſe its root ariſes near this lower border of the acetabulum.

4th, It is very obvious, that when the thigh bone is ſtruck in the direction of the dotted line (4) by a fall upon the trochanter, its head is beaten down into that part of the ſocket where the mucous ducts lie, and theſe ſoft parts are bruiſed, whence comes immediate and dreadful pain, high inflammation in the joint, and ſometimes ſuppuration and caries of the acetabulum, followed by anchyloſis.

5th, When the great trochanter is ſtruck obliquely from above downwards in the direction of the dotted line (5), any of all thoſe accidents may enſue, for the head of the bone is ſtruck ſo downwards into the ſocket, that very frequently the mucous ducts are injured; or being ſtruck thus obliquely, the head of the bone may be luxated downwards, by being driven over the border of the acetabulum at its ſhalloweſt part; or, finally, by being ſtruck thus obliquely, the neck itſelf may be broken.

In enumerating theſe conſequences, it is to be obſerved, that the effect of no particular blow is abſolutely limited, while yet it may in general terms be affirmed, that luxation is produced by a twiſt of the limb; fracture of the neck of the thigh bone by a deſperate leap or fall from a height; while falls in which the trochanter ſtrikes the ground, though they do ſometimes luxate or fracture the thigh bone, more commonly injure the acetabulum and its lubricating apparatus. It muſt be matter of wonder, indeed, how, ſince the ſoft parts within the ſocket are ſo eaſily injured, they ever eſcape diſeaſe in any of the common accidents of the joint? but it is to be obſerved, firſt, That the bone is luxated or fractured by blows or twiſts, which tend rather to turn the head out of the acetabulum, than to drive it down into the cavity. Secondly, That the mere laceration of an internal part, as of the central ligament, heals very eaſily; for in every caſe of lux-

ation it muſt be torn, and yet no diſeaſe enſues. Thirdly, The actual fracture or luxation produces no diſeaſe, becauſe that peculiarity of conſtitution is wanting which produces in boys the moſt diſmal conſequences from the ſlighteſt accidents, not in this joint only, but in all the joints. And, laſtly, We find, that even when, in conſequence of inflammation ariſing from mere local injury, the bones do inflame and throw out callus, it is a healthy inflammation like that of a granulating wound, and ſtops ſpontaneouſly as ſoon as the callus is formed, and the reunion of the neck of the thigh bone or the formation of the new ſocket completed.

Till the various accidents of the hip joint be accurately defined, a ſurgeon cannot know what appearances are to be contraſted (although, to diſtinguiſh any one accident of the hip joint, he muſt know and remember every accident); till the cauſes be deſcribed which occaſion thoſe various accidents, he wants the key to the proper inquiries; and, finally, till he has before him ſome ſenſible repreſentation of the poſture which the limb aſſumes in each of thoſe accidents, he muſt argue but very incorrectly! It is for theſe reaſons that I have drawn out for you a ſecond ſet of plans, in which the whole length of the limb is repreſented. When the patient has had his limb violently twiſted perhaps under a heavy load, we ſuſpect luxation; when he has taken a dangerous leap, and fallen to one ſide, or when he has fallen upon one knee, and the hip joint is hurt, we ſuſpect fracture of the neck of the bone; when the trochanter has been ſtruck with immediate and violent pain, we ſuſpect rather an injury of the acetabulum. But the actual condition of the limb may be aſcertained by the following marks:

1ſt, The limb being ſound, or but ſlightly hurt, is moveable, but not looſe; the joint moves eaſily and ſmoothly; you can turn the thigh bone in every direction, though not without a degree of pain proportioned to the injury; and this is principally to be noticed, that the point of the haunch bone, the knee and the great toe, are all in one direct line; or, in other words, the leg, thigh and body, all lie in the natural direction with regard to each other; and the limb being meaſured with its fellow, is of the ſame length, and anſwers knee to knee, ancle to ancle, and toe to toe; for though the patient will naturally diſtort the leg to give himſelf eaſe in the bruiſed part, yet the ſurgeon can by a little force make the limbs even. Figure 1ſt.

2d, When the thigh bone is luxated, the limb is always immoveably fixed by the entireneſs of the neck of the thigh bone, and the awkward poſture in which the head lies againſt the pelvis; and when the thigh bone is luxated upwards, we have the following deciſive marks of its condition: Obſerve, firſt, that the capſule is

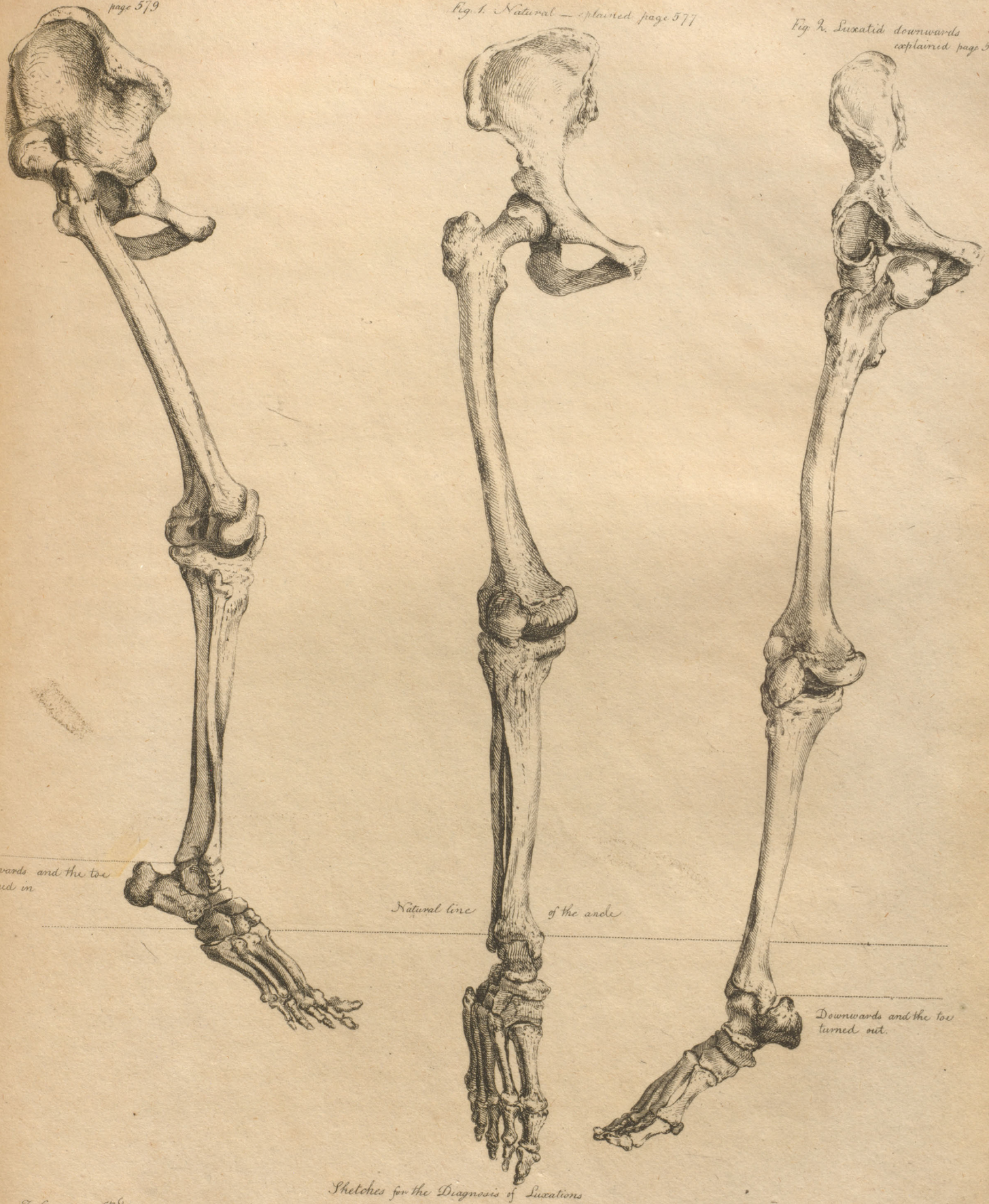
burſt, the central ligament torn acroſs, the middle glutæus muſcle in part torn up from its origin in the haunch bone, while the head of the thigh bone is lodged under it, and lies preſſed againſt the back of the haunch bone; the head of the luxated bone looks backwards towards the ſciatic notch, and ſometimes lies fairly lodged within the ſciatic notch, ſo as to cauſe a numbneſs of the limb by its preſſure againſt the ſciatic nerve. The effects then are as follows: The whole poſture of the limb is not ſlightly but very unequivocally diſtorted, the head and neck of the thigh bone are firmly braced down againſt the back of the pelvis by the ſurrounding muſcles, whence the limb, which lies in a very awkward poſture, is abſolutely immoveable. The head of the bone having ſtarted fairly over its ſocket, and lying even as high as the ſciatic notch, that is, at the diſtance of three or rather four inches from its natural ſituation, the limb is very remarkably ſhortened; for when the thigh bone thus riſes four inches, the heel of the luxated limb is oppoſite, not to the heel of the ſound limb, but touches it a little higher than the ancle, and, indeed, in the diſtorted poſture in which the patient lies, the heel of the luxated limb is nearly oppoſite to the middle of the ſound leg. Next the neck of the thigh bone being entire, and the head of the bone looking backwards towards the ſciatic notch, the whole limb is ſingularly diſtorted, the toe is turned inwards, or rather backwards, and the knee of the luxated limb falls in behind the thigh of the ſound one, and in this awkward poſture the limb is ſo immoveably fixed, that when you attempt to turn the thigh bone, you give great pain; in the moment of the attempt, you are ſenſible of inſuperable reſiſtance; indeed, if, you could turn the thigh bone, you would reduce it.

Now, when the limb is thus luxated upwards, if you lay your patient on his belly, you will find the leg half bent, and ſtanding up at right angles with the thigh; and taking the leg in your left hand, and working it like a rudder backwards and forwards, laying your other hand at the ſame time flat over the haunch, you will be ſenſible, every time the thigh bone is turned, of the ball or head of it turning under your hand; and when you perſiſt in turning it very largely and rapidly, you will be very ſenſible of the head and neck of the bone clucking againſt the haunch bone. But of all the marks, none is more particular than this, that the great trochanter riſes very high, the prominence which we call the haunch ſeems to be transferred very high up upon the hip, the thigh is remarkably ſhortened and flattened, and when you firſt begin to roll the thigh bone and to feel the joint, you would be apt to miſtake the trochanter for the head of the bone, and

Fig. 3 Luxatid upwards explained page 579

Fig. 1. Natural — explained page 577

Fig. 2. Luxatid downwards explained page 578




Sketches for the Diagnosis of Luxations

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Drawn & Engraved by J. Bell

the clucking noiſe of the luxated bone for the grating of a fractured one. Figure 2d.

3d, When the thigh bone is luxated downwards, the burſal and central ligaments are lacerated, the obturator muſcle which fills the thyroid hole is in part torn up from its origin, and the head of the bone is lodged in its place; the turning or rotation of the thigh bone is in this luxation alſo entirely prevented by the awkward poſture of the neck; the head of the bone looks forwards, or rather upwards, and the limb is as much fixed as when luxated upwards.

All the peculiarities of the diſtortion firſt deſcribed are reverſed in this luxation; the head of the bone is now lodged in the thyroid hole, a part of the pelvis ſo much lower than its natural ſocket, that the leg is lengthened fully three inches. The head of the bone in this luxation looks forwards and upwards, ſo that the toe which was turned inwards in the luxation laſt deſcribed, is turned outwards in this; and the head being now turned forwards, the knee, which in the upward luxation lies under the ſound knee, is in this turned remarkably outwards, while the whole limb is kept in a very remarkable manner ſtraddling away from the body. In the luxation upwards, the head of the bone is leſs diſtinctly felt, becauſe the trochanter is apt to be miſtaken for it, the head and neck lying deep under the glutæi muſcles, whereas in this luxation, the head of the bone is felt rolling very diſtinctly and ſuperficially in the groin, very nearly in the place of the venereal bubo, for at this point the joint of the hip is not covered with large muſcles, ſuch as the Glutæi, but with one thin and flat muſcle, the Pectineus, and the joint is ſo near the ſurface here, that the ſuppuration in the hip joint-diſeaſe uſually burſts firſt in the groin. Figure 3d.

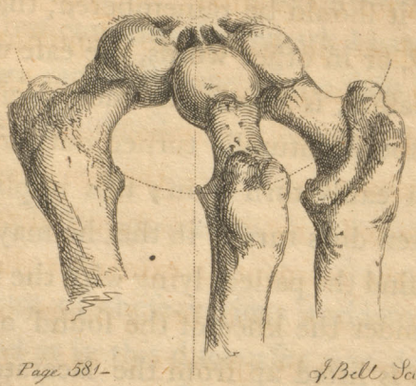
4th, The peculiar ſigns of fracture of the neck of the thigh bone are not leſs deciſive. The moment the neck of the thigh bone is broken, the bone is retracted by the power of its muſcles, it is turned ſomewhat round by the rotatory muſcles (the Obtur. Internus. quad. Femoris, &c.), operating upon the ſhaft of the bone; and while the head and neck of the bone remain in the ſocket, the broken part of the bone at the root of the trochanters mounts upwards. The following ſigns then muſt follow thoſe peculiarities in the poſture of the bone. Firſt, the moment the neck of the thigh bone is broken, the ſhaft of the bone is ſo retracted by the power of its muſcles, that you would imagine the bone to be luxated upwards; ſecondly, obſerving next the poſture of the leg, you find that the toe is not turned inwards, nor the knee of the hurt limb bent in under

that of the ſound one, nor is it turned outwards in that fixed, awkward, and ſtraddling poſture which indicates luxation downwards. Thirdly, you next begin to turn the limb and to hearken for crepitation; but you will remember that this fracture is diſtinct from all others, in having no crepitation, for the ends of the broken bone are not oppoſed to each other (as where a bone is broken acroſs its middle), but the broken neck of the bone remains in the acetabulum, while the part (i. e. the root of the trochanters) where the neck of the bone was broken away from the ſhaft is ſo retracted, that the fractured parts are never oppoſed to each other, unleſs indeed in the moment of extending the limb with the deſign of ſetting the fracture, for then the limb being drawn out nearly to its natural length, the fractured parts come to be oppoſite to each other, and the crepitation is diſtinguiſhed †. Fourthly, It is to be obſerved, that the limb cannot be fixed and embarraſſed by the neck of the thigh bone as in luxation; the connexion betwixt the head and ſhaft of the bone is deſtroyed; the limb is not only free, but abſolutely looſe! the natural thigh bone moves eaſily, but the broken thigh bone turns looſely, as far as a bone can turn looſely which is encumbered with ſuch a maſs of muſcles lying about it.

This alſo is very particular, it turns vertically like a ſpindle. If you take in your hand a ſound limb with the deſign of turning it, and lay the palm of your hand over the trochanter, you will be ſenſible that the bone moves ſlowly and ſteadily, becauſe it is connected with its neck. The head of the bone is the centre of motion,

† It is a very favourable inſtance of the candour and honeſty of Paræus, that he begins this ſubject with acknowledging a very ſingular miſtake: He had been called to a lady who, after a fall, had the limb ſo ſhortened and the toe ſo turned in, that he believed it a luxation, reduced it (as he imagined) and applied but a ſlight bandage, not apprehending that the limb would be ſhortened again. But two days after, upon viſiting her, he found the limb as ſhort as before, and it was only upon extending it a ſecond time that he felt the crepitation or underſtood the limb to be fractured. It is, perhaps, worth while to obſerve, that the crepitation, when it is felt, is not like that of any other broken bone, it is an obtuſe grating, more like the feeling which the ſtaff gives when it rubs againſt a ſtone. "Quelquesfois il ſe fait fracture pres la jointure de la hanche au col de l'os femoris: ce que *ie proteſte avoir* veu en une honneſte Dame, ayant eſté appellé pour la penſer. Voyant que ſa jambe eſtoit plus courte que l'autre: avec une eminence que le trochanter faiſoit exterieurement au deſſus de la jointe de l'iſchion; i'eſtimois de prime face, que ce fuſt la teſte de l'os, et y avoit luxation, et non fracture. Alors je tiray et pouſſay l'os ce me ſembloit en ſa boëte, attendu que les deux jambes eſtoient égales en longueur et figure: et la penſay et accouſtray comme d'une luxation. Deux jours apres ie la fus revoir, qui ſe plaignoit ſentir une extreme douleur, et trouvay *ſa jambae courte, et ſon pied tourné au dedans.* Alors je deſis toutes les bandes, et trouvay l'eminence comme auparavant. Adonc ie m'efforçay derechef à reduire l'os en ſa boëte. Cependant i'apperceu que l'os crepitoit." PAREE, p. 343.

the trochanter is at the diſtance of three inches from that centre, and moves in large circles, of which the neck of the thigh bone is the radius; but when the ſhaft is broken away from the neck, the ſhaft of the bone is itſelf the centre of motion, the trochanter of course turns vertically in its place without making any circle, it merely turns like an axis.



Page 581. J. Bell Sculp.

The fracture of the neck of the bone then is eaſily diſtinguiſhed from luxation, by the eaſe with which the limb is turned, by the thigh bone turning vertically upon its axis, by the leg being much ſhortened, eaſily lengthened by extending it, but very difficultly retained. But though I affirm that the thigh bone is eaſily turned and moved in various directions, I mean ſo only in reference to the mechanical reſiſtance, for it is not moved without dreadful pain! the ragged trochanters and broken part of the bone are lodged among the ſoft parts, and every time you try to draw the leg outwards, the patient ſuffers dreadful pain from the preſſure of the broken part of the femur againſt the lacerated parts which lie on the back of the haunch bone; thence it is, that the patient is no ſooner laid in bed than he inclines the knee inwards, and diſtorts the limb in order to raiſe the broken end of the bone and prevent it preſſing againſt the lacerated fleſh.

This laſt obſervation reminds me of the neceſſity of explaining two doubtful points in the diagnoſis; firſt, it is not certain that the toe is always turned outwards; ſecondly, it is not certain that the limb is always immediately ſhortened.—You may have obſerved (*vide* foot note, page 580.) that Paræus deſcribes the toe as turned inwards, "La jambe court et ſon pied tourné en dedans." Petit alſo, in his Maladies des Os, mentions, that being called to a patient under the care of a ſurgeon who had not read Paræus, and who miſtook the nature of the injury, "he found, upon undoing the bandages, the great trochanter four inches higher than its natural ſituation, and the toe and the knee turned inwards †." Now, although Mr. Petit is here plainly narrating a caſe, and reporting a very certain fact,

† "L'appareil étant défait, je ſentis le grand trochanter quatre doigts plus haut qu'il ne devoit être, ce qui, joint à ce que la *pointe du pied et le genou étoient tournés en dedans*, me fit croire que l'os étoit luxé en haut et en dehors; mais, ayant pris le pied, j'en tournai la pointe en dehors ſans réſiſtance, et je reconnus par là qu'il y avoit fracture au col du fémur."

he is accuſed of merely copying what is conſidered as a blunder of Paræus! and the moſt celebrated ſurgeons, as Lowis Sabattier and others, plainly affirm that the toe cannot be turned in. But it ſhould be remembered, that the eaſe with which the thigh bone turns vertically, or in other words, the eaſe with which we turn the toe outwards or inwards at pleaſure, is among the moſt deciſive marks of this kind of fracture; that though the toe is naturally turned outwards by the action of the rotatory muſcles, yet we can eaſily turn it in; this implies that the patient himſelf can turn it in! He often does turn it in that he may lie with greater eaſe! and accordingly you will often find the patient lying with the toe turned in, and the knee of the hurt limb turned under the knee of the ſound one, for in this poſture the fractured part of the bone is lifted up from the lacerated fleſh. In ſhort, there are two poſtures of the limb, firſt, That which it takes while the parts are inſenſible immediately after the accident; ſecondly, That which it is inſtinctively put into for eaſe after the patient is laid in bed. But though the poſture of the limb comes thus to be nearly that of a luxated thigh, viz. the limb ſhortened, the toe turned in, the one knee falling under the other, yet ſtill fracture is eaſily diſtinguiſhed from luxation by the mobility of the limb.

Secondly, There is one point more in which there is a degree of uncertainty, for the moſt deciſive ſymptom of all is ſometimes wanting, I mean the ſhortening of the limb: The ſhortening of the limb in fracture of the neck of the thigh bone, is not, as in luxation, the unavoidable effect of the poſture of the bone; it is an accidental conſequence of the contraction of the muſcles, and ſometimes theſe are ſo benumbed by the injury, or ſo inactive from ſome other cauſe, that they do not pull up the thigh bone. Even though we were leſs able to explain the fact, we are not leſs conſtrained to receive it, it ſtands upon record. Sabattier has, in conſultation with Lowis, Foubert, and Gourſoud, ſeen on ſeveral occaſions the neck of the thigh bone broken, the limb remaining of its uſual length, and the retraction happening ſuddenly, from the patient being turned rather rudely in bed by the helper of the hoſpital. Sometimes this retraction has taken place on the fourth or fifth, ſometimes not till the twenty-third day after the accident.

Yet here there muſt be a deception, when Sabattier tells us of a boy of fifteen years of age who, after receiving a blow upon the trochanter, walks home, feels pain next morning, lies two months in bed, and after that has a ſhortening of the thigh †;

† Un jeune garçon de quinze ans ſe laiſſa tomber entre deux pieces de charpente ſur leſquelles il marchoit il ſentit une légére deuleur à la cuiſſe gauche qui ne l'empêcha pas de regagner à pied et ſans boiter ſa maiſon, diſtante d'environ deux portées de fuſil. p. 638.

and more eſpecially, when he tells of another who continued to walk about for two months after the accident ‡, what are we to underſtand but that it is very poſſible to confound the injury and caries of the acetabulum, with the fracture of the neck of the bone? this but confirms the remark I hazarded in opening this ſubject of the diagnoſis, that we can truſt none of the facts that are affirmed even by the beſt modern writers on this ſubject.

## CONCLUSION.

A ſlight and eaſy pathology of theſe various accidents, and an accurate diagnoſis, is all that I have aimed at in this diſcourſe; nor do I know of any ſubject in ſurgery which ſo well merits a careful recapitulation. The diſorders which need to be diſtinguiſhed from each other are, fracture, luxation, bruiſe of the acetabulum, and the ſcrophulous diſeaſe of boys, ſeated unqueſtionably in the bones; and the chief ſigns are, the length of the limb, the direction of the toe, the place of the trochanter, the elongation or ſhortening of the limb, and the manner in which it turns when moved by the ſurgeon.

Firſt, We are aſſured that the thigh bone is luxated downwards, when the accident has been a twiſt of the limb, or a blow upon the very top of the great trochanter; when the thigh is elongated three inches or more; the toe turned outwards, in a ſplay-foot poſture, and kept ſtraddling away from the body with great pain. This luxation is accompanied with a proportioned diſplacement of the great trochanter; the hip is flattened, and in lean people you can diſtinguiſh the head of the bone rolling in the groin, though not in fat ſubjects, nor in women whoſe pelvis is broad and flat.

Secondly, We diſtinguiſh luxation upwards by the remarkable ſhortening of the

‡ J'ai vu auſſi un cas de cette eſpece et même beaucoup plus extraordinaire en ce que le malade a continué de marcher un mois après l'accident qui lui avoit rompu le col du femur. p. 639.

It is alſo very remarkable, that Mr. Sabattier ſays, that in caſes where there is no retraction, "The extreme pain and abſolute lameneſs are the only ſigns, and are ſure ſigns of the fracture." Yet certainly where there were no retraction, or in other terms where the broken pieces of the bone were rightly oppoſed to each other, crepitation muſt have been as natural, inſeparable a ſign of this fracture as of any other, eſpecially when his patient walked about for days and weeks. But this is idle criticiſm; there never was a caſe in which a man walked about with a fracture, even in the middle of the thigh, where the bones are regularly oppoſed to one another, much leſs in a fracture of the neck, where though the bones may touch each other laterally, they never can be oppoſed to each other, nor ſupport the weight of the body.

limb, by the ham being crooked, the knee of the luxated ſide turned cloſe in under the thigh of the ſound ſide, and the toe turned inwards or almoſt backwards. The great trochanter riſes very high, and the thigh is flattened in this caſe as much as the hip is in the laſt mentioned. The patient lies on his ſound ſide almoſt on his face, and when you take hold on the leg which ſtands up, and begin to turn it, you, by laying your hand over the moſt tumid part of the haunch, feel firſt (becauſe it is the moſt prominent point) the rolling of the trochanter, and then by carefully examining and turning the thigh bone, you at laſt diſtinguiſh the head of the bone.

Thirdly, When the neck of the thigh bone is fractured, the limb is remarkably ſhortened, the trochanter is higher than its natural place, the thigh is flattened, the pain is exquiſite, and the general appearance is that of a thigh bone luxated upwards! but the moment you take the limb in your hand, you diſtinguiſh this from all other accidents; for while the limb is ſo remarkably ſhortened as to leave no doubt of ſome very eſſential injury having happened, it yet turns ſo eaſily as to prove that it is not luxated, and indeed it turns ſo looſely as to prove that the limb has not that degree of ſteadineſs which the natural connexion of the ſhaft of the thigh bone with its head and neck ſhould give. The limb is ſhortened, but is eaſily lengthened; the toe is turned out, but is eaſily turned in again; in ſhort, the manner in which it moves will ſatisfy you at once that the ſhaft is ſeparated from the head of the bone. If crepitation be not among the immediate ſigns of this fracture, it is becauſe the bones are not, as in other fractures, oppoſed to each other; if crepitation be felt afterwards, it is only when the limb is extended, and the bone ſet, or in other terms the broken parts regularly oppoſed to each other.

Fourthly, When the patient has fallen upon the trochanter or received a blow, when the head of the bone has been ſtruck down into the ſocket with violent pain, when the patient becomes inſtantly lame, and lies in a crooked poſture, with the knee of the injured limb bent in under that of the ſound, (in order to raiſe up the head as much as poſſible from the inflamed ſocket where its preſſure occaſions pain,) when, along with theſe appearances, we are perfectly ſenſible that the limb, though crooked, is not ſhortened, when we find, that though when moving it occaſions dreadful pain, yet it does move eaſily and ſteadily, we may be aſſured that the fall has occaſioned merely a bruiſe in the acetabulum. In this caſe the patient lies crooked in bed, the pain is exquiſite, the patient cannot bear to have the joint touched, or the limb moved, the ſlighteſt motion is terrible to him, to ſtretch out

the limb is excruciating. The ſurgeon has not leave to handle the limby freely, or is prevented by his own timidity, and by the ſhrieks of the patient; he miſtakes the nature of the injury, makes cruel attempts to reduce a bone which is neither fractured nor luxated, and does eſſential injury to a joint already much injured; perhaps he never doubts of the limb being luxated or fractured, till, after ſome months of the ſevereſt miſery, the pain remits, the patient begins to walk, and recovers at laſt the uſe of his limb.

This mere bruiſe of the acetabulum is unqueſtionably the diſeaſe which Petit deſcribes, where he ſays that he has often prevented it coming to any height by applying aſtringent ſolutions, and defenſives made of alum, and whites of eggs, with ſpirits of wine. Reſt is of chief ſervice, but reſt need hardly be recommended to one in ſuch exquiſite torture, whoſe pains are aggravated by the ſlighteſt motion.

Fifthly, When a ſcrophulous boy under eighteen years of age has laboured for long under a diſeaſe of this joint, where there is great lameneſs, little pain, a puffy ſwelling, an elongation of the limb! if there come at laſt acute pain, hectic fever, ſymptoms of internal ſuppuration, and at laſt an abſceſs upon the hip or groin, you know that it is the conſtitutional diſeaſe, that it is ſeated in the bones, that it is analogous to the white ſwelling of the knee, or curvature of the ſpine; but unlike the diſeaſe of the knee joint, this of the hip cannot be amputated, and the boy muſt go through the fiery ordeal, and often dies from fever and irritation, great profuſion of matter, and caries of the bones. If he ſurvive, it is uſually with a limb emaciated, crooked, hanging in air, and fixed by the anchyloſis of the femur with the haunch bone. The chief cauſe of ſuch diſeaſe is the ſcrophulous condition of the ſyſtem, the imperfect oſſification of the bones, the great extent of diſeaſed ſurface, and from the occaſional ſhocks which this great joint ſuffers, in conſequence of its ſupporting continually the whole weight of the body. The chief danger of the diſeaſe is the boy feeling but too little pain to make himſelf or his parents ſenſible of the danger; if it be not chiefly in conſequence of the preſſure and motion that ſuch diſeaſe goes on to the laſt ſtage of caries, yet certain it is, that under the preſſure of the whole weight of the body ſuch a diſeaſe cannot be cured; the only chance, then, of recovery, is from wine, generous diet, cold bathing, cauſtics, iſſues, and abſolute reſt.

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# DISCOURSE XIV.

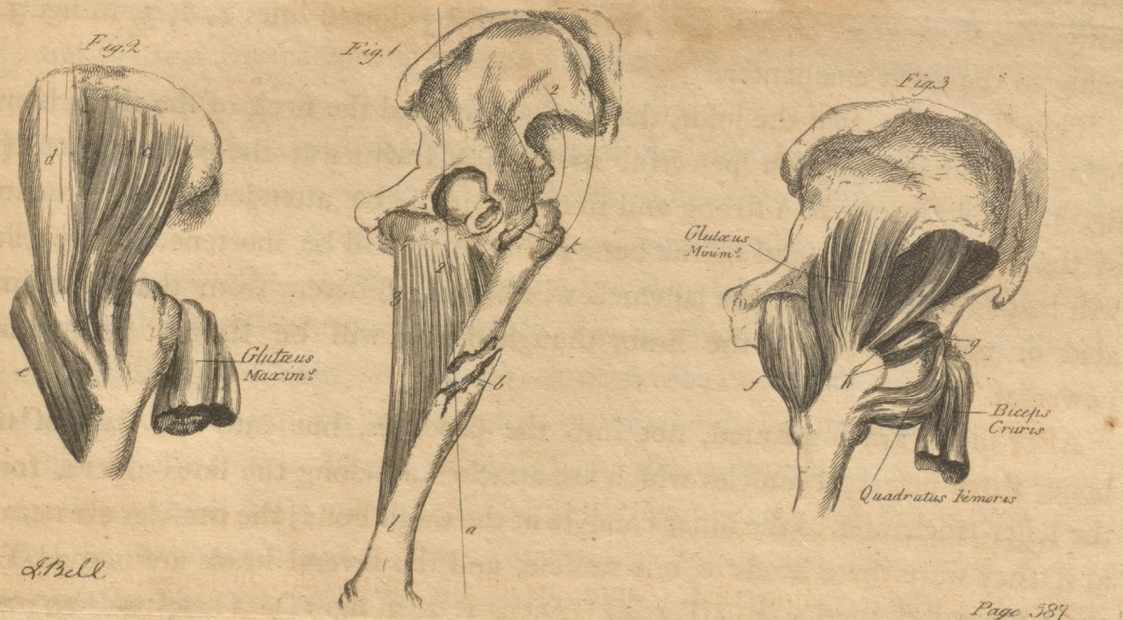
## OF FRACTURE OF THE THIGH BONE, AND OF THE IRRESISTIBLE CONTRACTIONS OF THE MUSCLES AND SHORTENING OF THE LIMB.

NUNQUAM OS EA PARTE VINCIENDO GLUTINARI ET MEMBRUM IN ANTIQUUM STATUM REVERTI POTEST. *Platner*, § 1272.

It is not without reaſon that I appropriate an entire diſcourſe to this ſubject, the fracture of the thigh bone, or rather the contraction of the thigh. The ſubject is itſelf a ſtudy, a moſt intereſting ſtudy: this is of all fractures the moſt difficult of cure; the machine is not yet invented by which a fractured thigh bone can be perfectly ſecured. The natural obliquity of the thigh bone in relation to

the pelvis is ſuch, that all its fractures, even in its middle part, are naturally oblique, and thoſe thick and fleſhy muſcles which ſurround the thigh bone at its upper part, and give the thigh its conical form, contract with ſuch irreſiſtible force, that when the thigh bone is broken acroſs at its neck, or at the root of the trochanters, no power of machinery (the reſiſtance of the bone itſelf being wanting) can prevent the ſhortening of the limb.

Perhaps there is nothing in the profeſſion that has more agitated the minds of ſurgeons in all ages, than the expectation of diſcovering ſome machine capable of reſtraining the contractions of a fractured thigh. The machines, bandages, and other inventions, for preſerving the thigh extended, are indeed innumerable; but the principles of theſe inventions are incorrect, the machines themſelves are awkward and torturing to the patient; perhaps the natural cauſes of the contractions are too powerful to be antagonized by any force of machinery, by any force at leaſt which the natural ſtructure of the limb, or the courage and conſtancy of any patient, can endure. Let us then, before we enter upon the hiſtory of thoſe inventions, conſider the natural cauſes of this retraction of the fractured bone, that we may not deſpair of achieving a cure where the fracture is curable, nor ſtruggle in vain againſt inſurmountable obſtacles.

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In theſe plans you will obſerve, firſt, The obliquity of the thigh bone with regard to the pelvis, for the pelvis is wide, and ſeparates the thigh bones above, but at their lower ends the thigh bones approach, and at the knees they touch

each other. In conſequence of this obliquity, the thigh bone generally receives the force which fractures it in the direction of the dotted line (a), which gives almoſt always the oblique form (b) to the fracture. Next, you will obſerve that I here demonſtrate powerful muſcles which have been already mentioned, as cauſing the retraction of the thigh. Theſe muſcles ariſe from the pelvis, and are implanted into the thigh bone at its trochanters, to perform in a particular manner the rotatory motions of the thigh. They are of very great ſize, proportioned to the whole weight of the body, for they have to move the whole weight of the body by bending it forwards upon the thigh bone at every ſtep. They are all placed about the top of the thigh, which gives the thigh its pyramidal form. They are eleven in number; firſt, the Iliacus, Internus, and Pſoas (figure 2. c d) coming down from within the abdomen to be implanted into the leſſer trochanter; next, the Pectinalis (e) coming from the pecten or pubis to be inſerted in the linea aſpera at the root of that trochanter; next, the Obturator Internus (f, fig. 3.) coming from the thyroid hole, or rather from the obturator ligament, to be implanted into the ſame point, the inner trochanter; next, the Obturator Internus (g), the Gemini (h), and the Pyriformis (i), coming from the back parts and inner ſurface of the pelvis to be implanted into the great trochanter; and laſtly, the three great Glutæi muſcles (deſigned by dotted lines 1, 2, 3, in fig. 3.) going to the great trochanter.

Thus it is plain, that the joint, the trochanters, and the neck of the thigh bone, being ſurrounded by ſuch powerful muſcles, a fracture at the point marked (k fig. 3.), will always, in a ſtrong and muſcular man, be attended with retraction of the lower fractured end of the bone; the thigh will be ſhortened, the perſon will halt to that ſide, but the lameneſs will be very different from that of a luxated or ulcerated joint; the limb, though ſhort, will be ſtrong, fleſhy, and powerful.

After theſe, are implanted, not into the proceſſes, but into the ſhaft of the bone, three powerful muſcles which are attached all along the linea aſpera, from the leſſer trochanter to the inner condyle of the thigh bone; the muſcles are named as if they were three heads of one muſcle, and the ſeveral heads are named Triceps, Primus, Secundus, and Tertius (triceps 1, 2, 3, fig. 1.). Theſe muſcles complete the conical form of the thigh, they draw the knees cloſe together, they cooperate in ſhortening and diſtorting the limb when the fracture is at (k), and even when the fracture is at (b), eſpecially if it be oblique, the contraction of

theſe muſcles turns out one end of the bone and ſhortens the whole thigh; but when the fracture is any point (as at l) below the chief inſertions of the triceps, there is not either in man or boy any ſhortening of the limb, both becauſe there are no muſcles to diſtort it, and becauſe the rectus cruris and other muſcles moving the leg, ariſe fleſhy from the thigh bone, and by the hold they have upon the ſhaft of the bone all round, they rather tend to ſupport and ſteady the fractured part. There is no diſtortion unleſs the thigh be uncommonly oblique, or unleſs the thigh be convulſed, the patient delirious or maniacal, or much of the bone be cruſhed to pieces and deſtroyed.

But there is a kind of deformity peculiarly frequent in this very caſe, where there ſhould be none. The fracture is near the leg, the leg is heavy, and the weight of the leg is allowed to turn the thigh bone vertically, the heel ſinks, the toe turns out, the thigh bone (the lower end of it I mean) turns a little upon its axis, the ſlighteſt turning of the thigh bone gives a remarkable inclination of the foot, and the leg being permitted to lie thus a little turned round during the cure, the patient when he riſes is found to walk as if he were ſplay-footed. In boys I have ſeen this deformity leſſen by degrees, till it was no longer perceived, the ſhape of the thigh bone, and the turns of its muſcles, gradually accommodating themſelves; but in men the deformity is permanent, they drag the leg, and the foot goes along the ground ſide foremoſt, with an appearance of paralytic weakneſs.

We thus perceive, that the ſhortening of the limb proceeds from natural cauſes, which perhaps no power of machinery can ever counteract, none at leaſt which the frame and texture of the limb itſelf can withſtand, or which any patient can endure, although excited to endure to the utmoſt by the apprehenſion of lameneſs and deformity. This is a difficulty with which we are, perhaps, doomed for ever to ſtruggle in vain; for the power of reſiſtance in any machine is applied at once, and cannot be increaſed or renewed but by intervals! while the retraction of the fractured bone proceeds from the continual inſenſible niſus of the muſcles, which ſteals upon the reſiſtance; a ſlight contraction thus continually exerted, muſt overcome the reſiſtance of the beſt regulated machines; it is the wind and the ſun contending for the man's cloak; the leſs perceptible or violent this muſcular contraction, it ſeems to be but the more irreſiſtible.

Whatever has been contrived for preſerving a fractured thigh from this contraction, it is my duty to explain. I have indeed but a poor opinion of thoſe

engines with which patients have been tortured, but I cannot withhold from you the knowledge of whatever has been invented by old or modern ſurgeons; it is fit that you know how anxious all the moſt ſenſible men of our profeſſion have been concerning this contraction of the thigh, what means they have propoſed for the prevention of it, how the common machines are applied, and how they may be improved. But while it is my duty to explain thoſe machines, it is my privilege to tell you how little uſeful I myſelf have found them.

I ſhall begin this hiſtory from the beginning, for Hildanus was the firſt, at leaſt among modern ſurgeons, who invented a machine for reſtraining the contractions of a broken thigh. However much we may be delighted with the appearance of ingenuity, or buoyed up with ſanguine expectations from curious and complicated machines, yet we in the end return to the moſt ſimple contrivances, and I have no heſitation in giving that title to the machine of Hildanus; it ſeems indeed ſo ſimple that we ſhould be apt to neglect it, but it is in truth the original of all after inventions, and though others may appear more ingenious, I proteſt that this is the moſt uſeful.

" A little girl of eight years of age having fallen from the firſt floor upon the pavement, had her left thigh bone broken, and being immediately called," ſays Hildanus, " I found a fracture of the thigh bone juſt below the leſſer trochanter, with a remarkable projection or elbowing of the end of the fractured bone, and a no leſs remarkable ſhortening of the limb; but I eaſily reduced the bone, I bandaged up the limb with ſplints and compreſſes, renewing the bandage every third day. Until the fourteenth day, every thing went on proſperouſly without pain, fever, or any diſtreſſing ſymptom, but on the night of the fourteenth, the little girl, being reſtleſs from the heat of the weather, and tormented with the flies and fleas, moved ſo continually with her body and thigh, that during the twenty-four hours her limb was remarkably ſhortened, and the elbowing or projection of the bone appeared again. You may imagine (ſays Hildanus) what woful deformity muſt have enſued, had I not been furthered by God's good grace †."

† " Puella octo circiter annorum, filia Magiſtri Abraham Meyeri, Civis Bernenſis, cum 28. Menſis Junii, Anno milleſimo ſexcenteſimo vigeſimo tertio, ex ſuprema contignatione domus in pavimentum cecidiſſet, os femoris ſiniſtri in altiori parte fregit. Ego eadem hora accerſitus, fracturam completam circa proceſſum minorem vel inferiorem, à Veſal. offium tabulâ primâ V. notatum, cum inſigni extuberantia oſſis fracti, verſus externam partem femoris inveni; crus quoque longe brevius erat altero."—" Cæterum os confractum feliciter repoſui, et applicatis medicamentis convenientibus et ſpleniis, crus in capſulam ita adaptavi;

The inſpiration which Hildanus piouſly acknowledges, was the invention of that very ſimple machine which is drawn at the head of this chapter; it was a large caſe hollowed to receive the thigh and keep it ſteady; it was made of tin, bend leather, or buffalo's hide, lined and padded with flannels, ſo as to lodge the thigh pleaſantly as well as ſafely; and it was buckled round the pelvis, knee, and upper part of the leg, with large circulars or ſtraps; in this caſe or trough of Hildanus, the limb lies in a poſture quite natural, eaſy and relaxed, it lies open, ſo that we can at all times be ſenſible of any accidental ſhortening or retraction of the thigh, it lies ſidelong firm and ſolid, ſo as even by its weight to preſerve its extenſion, and it is eaſy at any time to renew the extenſion by ſtretching the limb out gently with our hands; and to retain it with a moderate, and not unpleaſant degree of firmneſs, by buckling the ſtraps anew. This is the plain and ſimple machine which ſurgeons have forſaken for a ſucceſſion of ingenious follies.

Yet, for many years, ſurgeons imagined nothing but the moſt ſimple and modeſt contrivances for ſecuring a fractured limb; nor were there to be ſeen fifty years ago, any of thoſe rods, ſcrews, knobs, and buckles, with which machines of modern invention are encumbered. The method which I am now going to deſcribe, was long the favourite manner of ſetting a fractured thigh. I ſhall deſcribe this apparatus for diſtinction's ſake, under the title of the LONG SPLINT of Duverney, not becauſe it was peculiar to him, ſince it was uſed by his contemporaries and by older ſurgeons, but becauſe he uſed it of that uncommon length, that it was almoſt a ſtilt rather than a ſplint, extending not merely along the fractured limb, but along the whole body: It was a ſtiff ſplint made of thin board or of bend leather, it was laid along the body, reaching almoſt from the arm-pit to ſome diſtance beyond the extremity of the heel. The patient was in a manner laid upon the ſplint, which was fixed by a ſucceſſion of circular bands ſurrounding the pelvis, leg, and thigh, one or more turns of a bandage went

ut in decimum quartum uſque diem omnia nobis ex voto ſuccederent, et a dolore omnibuſque ſymptomatibus immunis ægra eſſet; interim tamen fracturam de tertio in tertium diem, pro more curavi. Sed quid fit? Cum quadam nocte muſcæ et pulices præter modum vexarent puellam, et proinde corpus et crus commoveret, ut ſpacio viginti quatuor horarum mirum in modum extuberaret, et crus longe brevius evaderet altero, uti ex figura, quam poſtea addam, videbis. Vides qualis deformitas et claudicatio ſequuta fuiſſet? niſi Deus ſuâ gratiâ mihi adſtitiſſet."

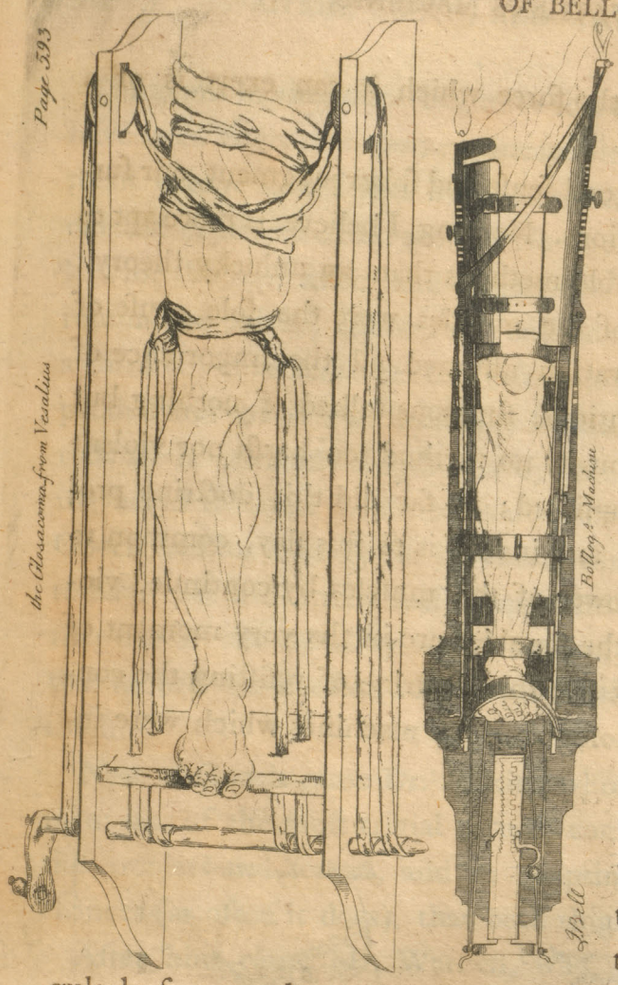
The figure Hildanus mentions here is that which I have drawn at the top of this chapter.

like the tail of a T bandage round the fork under the hip, to ſecure the hold upon the pelvis; while on the outſide again, the top of the long ſplint was let into a bandage or folded towel, which was paſſed round the thorax. Thus was the ſplint fixed and prevented from ſlipping upwards, while the limb was kept extended by the circulars ſurrounding the knee and ancle; and though ſometimes there was laid oppoſite to this, a ſhort ſplint upon the inſide of the thigh, yet that ſeems to have proceeded from the unwillingneſs of ſurgeons to forſake old and approved methods all at once, for it was from the long ſplint only that they could expect to ſteady the thigh.

This is a method which ſhould not be ſuddenly forgotten. The long ſplint has indeed the diſadvantage of keeping the whole limb in an extended poſture, but then it makes the whole limb one piece as it were with the body, it prevents rolling of the thigh bone, ſecures in ſome degree the extended ſtate of the limb, and enables the patient to be turned or moved on every neceſſary occaſion without danger of diſplacing the fracture; it has been ſtill the reſource of the ſurgeon in his diſappointments and difficulties; and Mr. Deſſault among others, though he boaſts much of his own peculiar method of fixing the body towards the head, and extending the limb towards the foot of the bed by lacs or bandages, ſeldom neglected to uſe, at the ſame time, the long ſplint of Duverney, to which, no doubt, was owing much of his ſucceſs.

I am now to deliver the hiſtory, not of improvements, but of deviations from the ſimplicity of thoſe machines of Duverney and Hildanus, of engines ſo complicated, that it is difficult to deſcribe, impoſſible to uſe them, which would carry off the palm from the moſt curious engines of the Inquiſition, which indeed never did exiſt, except on paper, or in thoſe chambers of the Royal Academy in France, where models of ſhips, and mills, and ploughs, and fracture-boxes, were tumbled together.

There have been, both in other countries and in England, ſurgeons delighting in the ſame trifling ingenuity, who, forſaking the rules of common practice, and the ſoundeſt principles of ſurgery, have been proud rather of demonſtrating what machinery could do, than in reflecting wiſely on what the living body could bear. Perhaps there never was a more tremendous exertion of this kind of talent, than the machine of Mr. Belloq. which has been for half a century praiſed by all the ſurgeons of France, though uſed, I dare ſay, by none.



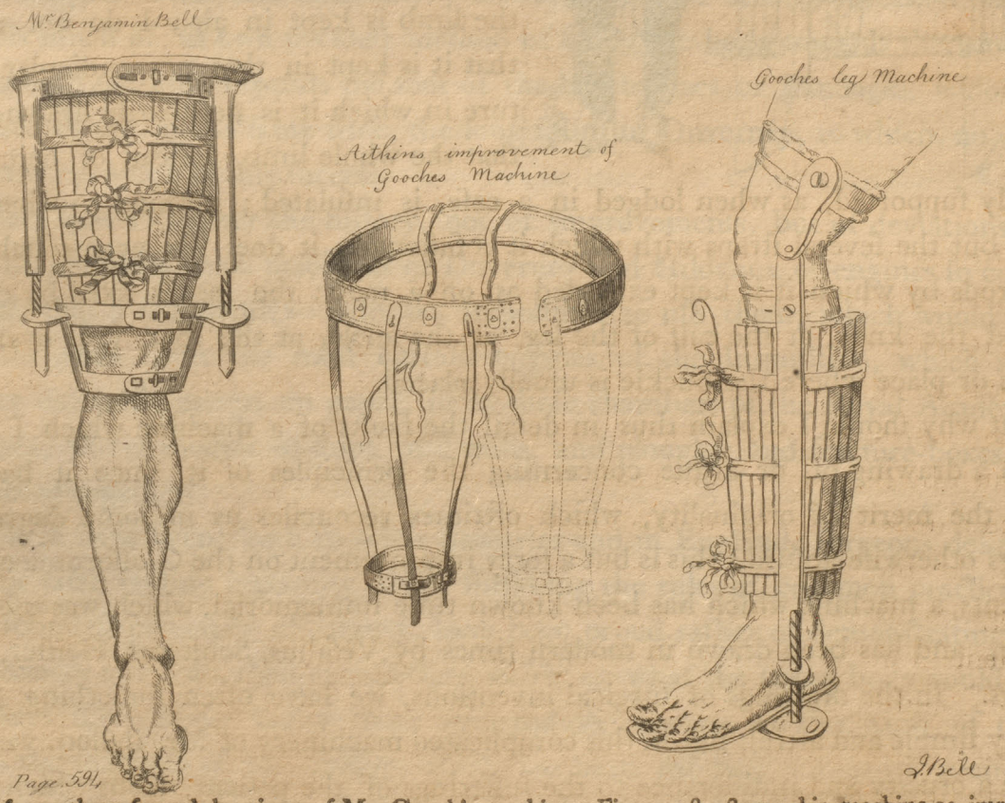

The machine of Mr. Belloq. member of the Academy of Surgery in France, conſiſts of two parts, one which is ſteady, and has connected with it a ſort of caſe in which the thigh is firmly encloſed; the other, which is moveable, runs in grooves, and is elongated by a vice or windlaſs; with this moveable part the leg, foot, and ancle are connected; the thigh is cloſe laced in the caſe as if in boddice, while the knee, the ancle and the foot, are bound very firm by braces or leather circulars, and when all the apparatus is fixed, the turning of the key or windlaſs extends the limb.

By this cruel and complicated engine the limb is kept in air; I do not mean that it is kept in that perpendicular poſture in which it is neceſſarily drawn, but that the whole limb, inſtead of being regularly ſupported, as when lodged in a caſe, is inſulated; nothing touches the limb but the ſeveral ſtraps with which it is faſtened; it does not even touch the iron rods by which it is kept extended as on a rack; the leg is fixed by circulars at the knee, at the calf of the leg, at the ancle, at the foot, i. e. over the tarſus or place where the buckle is uſually placed.

But why ſhould I explain thus in detail the faults of a machine which I have given a drawing of, or argue concerning the principles of it, ſince it has not even the merit of originality, which ofttimes reconciles us in ſome degree to things otherwiſe abſurd? this is but a ſorry improvement on the Gloſſocoma of the ancients, a machine which has been known time immemorial, which was uſed by Galen, and has been drawn in modern times by Veſalius, Scultetus, Heiſter, and others. In the drawings of ſurgical inventions, we have often ſomething ſeducingly ſimple and artful, but in this complicated machinery of Mr. Belloq. we perceive a cruelty and indifference to the ſufferings of the patient, from which feeling and reaſon equally revolt; it is plainly copied from the gloſſocome which I

have drawn along with it ſide by ſide, and the force which it can exert is of a kind which no patient could endure.

To the ſhame of England, ſo famed for good ſenſe and ſober judgment, our ſurgeons alſo have gone in ſearch of new inventions. Nothing, I believe, is more apt to eſtrange medical men from ſimple and ſenſible methods than an unlucky theory; no ſooner was it obſerved that the ſpaſms of the muſcles were the ſole cauſe of the retraction of the thigh, than the obſervation aſſumed all the importance of a theory, became the rule of all new inventions, ſurgeons talked of nothing but reſiſting the power of the muſcles, and thought no method too harſh nor violent by which this great object could be accompliſhed; ſo far did this doctrine prevail, that in ſpeaking of luxations, it was, and indeed is to this day, common to think of nothing but wearying out the power of the muſcles by continued violence, though really the chief muſcles of the ſhoulder are in the very moment of the luxation torn away from the bones! It was this doctrine of reſiſting the contraction of the muſcles that gave riſe to thoſe torturing machines which were invented by Gooch, Aitkin, and Wathen.



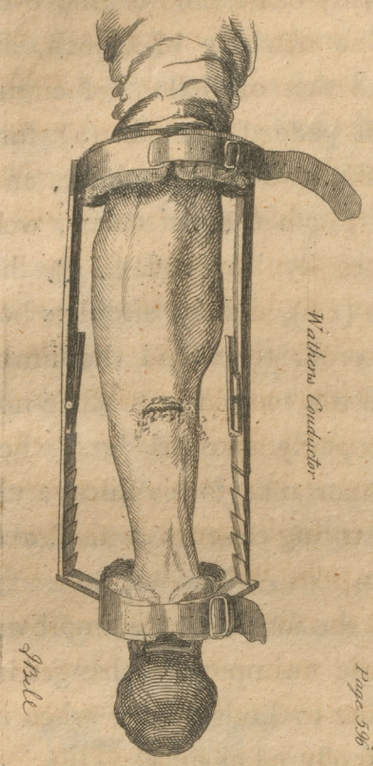

Theſe are three ſeveral drawings of Mr. Gooch's machine. Figure 1ſt, ſhows his machine as improved by Dr. Aitkin, where are ſeen the rods, the girths which paſs under the perineum, and the circulars for the

Surgeons having once begun to ſcrew the limb into an extended ſtate, ſeem to have been from that moment incapable of imagining any other kind of improvement except newer and more ingenious ſcrews. The machine of Gooch, an old and experienced ſurgeon of Norwich, conſiſts, like that of Belloq. of circulars for the hip, knee, and ancle; one large and well padded circular (a) ſurrounds the pelvis; another (b) embraces the thigh juſt above the knee joint, and a third (c) embraces the leg juſt below the knee. Thoſe three circulars, well padded and covered with ſhamoy leather, are connected by iron rods (d d), the rods are occaſionally lengthened by turning the ſcrews (e e), and the circulars being buckled round the limb, you turn the ſcrews in order to extend the limb. Gooch had his apology for inventing this machine; he was too old in practice not to have met with many real diſappointments, and he openly acknowledges (whether out of real humility we know not, or to give importance to his diſcovery), that he had been often and cruelly diſappointed in trying to cure a fractured thigh.

Next to Gooch came Dr. Aitkin, whoſe machine is the ſame, whoſe improvement was of the moſt trivial nature, conſiſting in ſome unimportant changes in the circulars and ſcrews, and in adapting the machine to both thighs, when it chances (as often it does), that both thigh bones are fractured at once.

After him came Mr. Wathen, who, anxious to ſave patients from the real injuries and dangers of being carried awkwardly by unſkilful attendants, invented a machine which he propoſes ſhould be applied immediately to a broken limb, and which from its preſerving the limb while the patient is carried home he calls a Conductor. It is manifeſt that Wathen's conductor differs in no reſpect from the machines of Gooch and Dr. Aitkin; it conſiſts, like them, of well padded circulars which buckle round the knee and ancle; the circulars are connected with iron rods which ſteady the limb, and the notches and checks on thoſe iron rods ſecure the extended poſture of the limb, and being applied above

pelvis and knee. Figure 2d, ſhows the ſame machine adapted to the leg; and in this ſecond drawing, the lower circular which ſurrounds the lower part of the knee joint is ſeen in outline. Figure 3d, is a figure from Mr. Benjamin Bell's book, in which his way of applying theſe machines is repreſented, and from which, I believe, the reader will form a pretty correct judgment of their effects. N. B. Both in the leg and in the thigh, both in Gooch's and Mr. Bell's drawings, are ſeen thoſe old faſhioned ſplints, &c. which ſurgeons have forſaken ſo unwillingly, and which were always applied under thoſe machines.



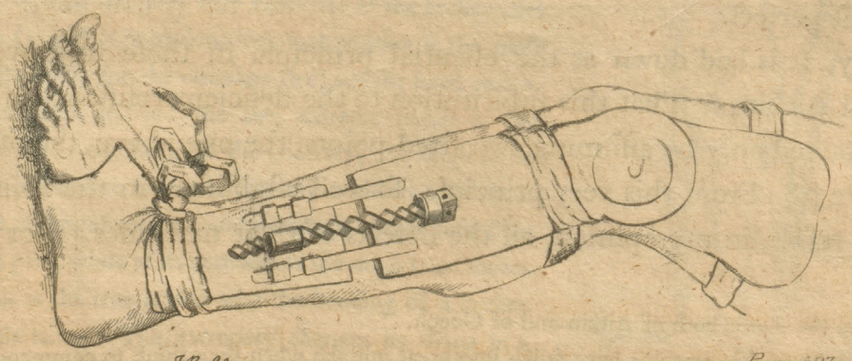

the ſtocking and breeches when the leg is broken, it enables the attendants to carry the limb ſafely, and ſerves as a conductor, and after the limb is properly bandaged and ſet, it may remain about the limb as a fracture machine. But, like the machines of Belloq. Gooch, and Aitkin, it graſps the limb only at diſtant points, as if with coarſe unfeeling hands, it ſupports the broken bones at their extremities only, while the general limb is left unſupported and in air; like other machines, it has been praiſed out of all meaſure by its inventor, and neglected by every other ſurgeon; like the other complex machines, it has been forgotten and neglected in favour of the ſimple ſplint, or the ſtill more unaffected practice of laying out the limb upon a pillow. This like other inventions of the kind, is explained to us by a drawing very nice and clean, but which, in place of being true, is a mere fiction; in place of reminding us of a fractured limb all ſwollen and disfigured, it reminds us rather of Sir John Falſtaff's ſarcaſm on the Prince of Wales's leg, " He wears his boot very ſmooth, like unto the ſign of the leg."

Nothing can be more ſurpriſing than the ſimilarity of thoſe machines, unleſs it be the anxiety of the ſeveral authors to be conſidered as the original inventors. Theſe authors exclaim in bitter terms againſt their contemporary writers, each accuſing the other of plagiariſm, of ſtealing his invention; but their mutual accuſations are, after all, but a verification of a good old proverb, which we need not repeat: Aitkin has in fact ſtolen from Gooch, Wathen from Aitkin, and all of them have ſtolen from Hildanus; no wonder, then, they found out each other's thefts †.

† The machine of Hildanus has an antique ſimplicity, while thoſe of Aitkin and Gooch have a moſt ſcientific complication. From the ſlight variety we find among theſe machines, one would really believe that the variation of a few ſcrews, knobs, nails and buckles, as fairly conſtituted a new machine, as a new preface conſtitutes a new book. Upon comparing the two books of Aitkin and Gooch, I do ſolemnly proteſt that I am not only at a loſs to ſay which had ſtolen the machine, which is exhibited in this plate,

I now proceed to compare theſe machines with the invention of Hildanus. Firſt—That theſe improvers have all had one common deſign, viz. of extending the fractured limb, and keeping it extended, is what I ſuppoſe none of them will chooſe to deny. Secondly—Hildanus ſeems, in his firſt machine which he invented in the caſe of the little girl, to have had no other purpoſe in view than to lodge the thigh ſolidly within a firm caſe, to extend it occaſionally with hands, and to ſecure it, when extended, by tying the circulars; but in the drawing of Hildanus, which I have given at the bottom of this page, it is plain that he alſo uſed machines in which the fractured limb being firmly embraced with circulars, was extended by the operation of ſcrews. Thirdly—Though I confeſs it is ſo far honourable to thoſe inventors that they have copied Hildanus, yet I cannot commend the ſpirit with which they have copied from him; they have joined two machines which he never joined; they have performed that extenſion by ſcrews which he performed only by the hand, extending the limb gently from time to time; they have kept the limb extended by two iron rods, while he lodged it ſolidly and ſafely in a broad tin caſe; in his machine the reſiſtance was univerſally diffuſed, in theirs it is limited to certain points of the limb. Since Hildanus at one time lodged the thigh in a ſimple caſe, and at another extended the leg by the operation of ſcrews, I cannot but conſider him as the original inventor, and theſe machines of Gooch, Aitken, and Wathen, as mere plagiariſms.

from the other, but which has ſtolen the Treatiſe on Fractures from the other; were I examined on ſoul and conſcience touching this point, I could no more diſtinguiſh the two books from one another, than I could diſtinguiſh two half crowns of the ſame coinage: The theory and the practice, the callus, oſſification, oſſific juices, profuſion of callus, extenſion, counter-extenſion, cooptation, bandages, rollers, circulars, ſtraps, buckles, and all! are of one pattern.



J. Bell. Page 597.

Unleſs I had reaſon to think the principles wrong, I ſhould not inquire thus critically into the hiſtory of thoſe machines. The principles of their inventions are two only, firſt, to inſtitute ſome ſteady reſiſtance to the contraction of the muſcles, or in other terms to keep the limb in a perpetual ſtrain, and, ſecondly, to make the preſſure at diſtant and fixed points, or in other terms, to apply the whole of the force neceſſary for ſteadying the limb upon particular parts of it, while the reſt of the limb is uncompreſſed and unſupported! But let us quote impartially thoſe aphoriſms in which the principles are laid down. Firſt, It is affirmed, that the cauſe of the retraction of the fractured bones is the contraction of the muſcles of the thigh; that this contraction of the muſcles muſt be oppoſed by ſome ſteady and permanent reſiſtance; "that the grand deſideratum is to create a temporary ſubſtitution to the now deficient oppoſition which was afforded by the thigh bone to the contractility of the femoral muſcles ‡,"—words which ſound well, and have made no ſmall impreſſion. Now, the muſcular contraction is a power which never ceaſes to act, which is indeed continually increaſing, while the hold of the circulars upon the knee and ancle is continually leſſening. The muſcular contraction is rather excited by being oppoſed, and when excited is irreſiſtible: it is this power which breaks the bone in fracture of the patella, and tears the tendon in rupture of the tendo-achillis! How then ſhould ſuch machines reſiſt it? But even allowing that ſuch machines have power to reſiſt the muſcles, and ſtrength enough to preſerve the extenſion, how ſhall we enable the ſoft parts to endure ſuch force, or how give them a perfect hold upon the limb? make but ſoft parts ſurrounding a joint uncompreſſible, ſo as to give a permanent hold, make them as hardy as thoſe iron bands, ſo as to bear to be thus graſped, and I will acknowledge the moſt powerful machines to be the moſt perfect.

Secondly, It is laid down as the eſſential principle in thoſe improvements of Gooch and Aitkin, "That this ſubſtitution to the deficient reſiſtance of the bones can be obtained only by aſſuming two fixed points, the one above, the other below the fracture ‡." From this very principle, ſo well eſtabliſhed in the opinion of the inventors, reſult, in my opinion, all the defects of their machines ‖; for that preſ-

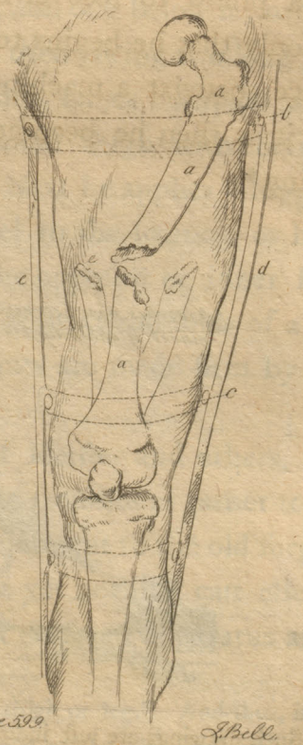
‡ Theſe are the words both of Aitkin and of Gooch.

‖ The inventors of this machine have fallen into great miſtake when they think to commend it, by ſaying that it operates only upon two diſtinct points of the broken bone. I am indeed ſatisfied that no machine

ſure is made at three diſtinct and diſtant points, which might have been diffuſed over the whole limb! in order to exert but a ſmall degree of force, the ancle, knee, and pelvis are ſorely preſſed; there is at thoſe points a partial and painful ſtricture, with intolerable galling, which the padding of the circulars can never prevent; the limb reſts upon no flat ſurface to keep it ſteady, but is wholly inſulated, thoſe points alone being compreſſed: in place of a great reſiſting power, which might have been eaſily obtained by a general bandage, which gives to every point its ſhare of preſſure, and of courſe its ſhare of reſiſtance, no more than a very ſlight reſiſtance is obtained, and that too by ſqueezing the knee and ancle in theſe iron circulars with great pain and intolerable galling. The limb is thus held continually as in the graſp of two cruel hands for ſix weeks, and while the heads of the bones are ſqueezed with intenſe firmneſs, the middle fractured part is left unſupported.

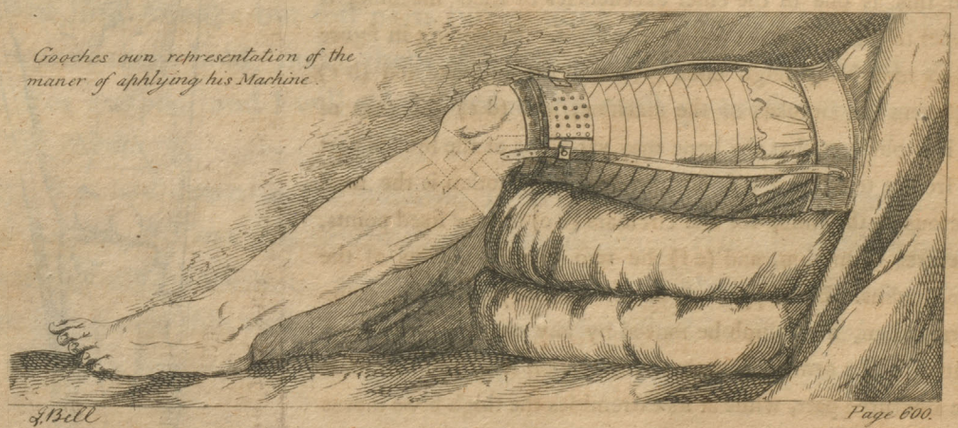
But of all arguments that of experience is the faireſt, and theſe machines have now been tried by time, that ſevere juſticer, who reſpects neither authorities nor names. There is no reaſon why I ſhould mention to you the experience which I

will operate to advantage which does not extend beyond both ends of the broken bone, and ſo far this machine of Gooch and Aitkin is good. By all the ideas I have of the condition of a broken limb, the circumſtance of ſteadying it ſeems to me a matter of infinitely leſs importance than authors have in general thought it; but ſince Dr. Aitkin and Mr. Gooch have mentioned this as one of the chief excellencies of their machine, it is proper to put this point in its true light. Suppoſing in figure (a a) to repreſent a thigh bone broken in the middle, and (b c) to repreſent the circulars of the machine, and (d e) the rods of iron, it is obvious, that the bone may vaccillate at the broken part (e f) from e to f; and it is obvious that ſuch motion is the moſt dangerous to the limb, for the circulars (b c) are the fixed points, the centres of motion, and (e f) the two extreme points of the moving radius. But ſuppoſing, on the contrary, the thigh to be left free, then, if the limb be moved by any accident, the fracture itſelf is the centre of motion, the motion is almoſt inſenſible at the fractured part, while at its extremities the thigh bone moves widely; and this is the true reaſon why the bending of a broken limb does ſo little harm. The extremity changes its ſhape in a very great degree without any remarkable motion in the immediate place where the fracture is, becauſe it is the centre of motion.



an individual have had, ſince the total diſuſe of thoſe machines expreſſes very unequivocally the opinion of the whole profeſſion; but could I venture to repreſent to you, the contentions I once entered into with a ſtubborn and ſturdy highlander in our hoſpital, who had fractured the neck of the thigh bone, I think it would cure you of all deſire to repeat the trial. I have on ſeveral occaſions tried thoſe machines with that impartial zeal with which it becomes us to receive any ſuggeſtion, eſpecially in a caſe of ſuch acknowledged difficulty. I have reinforced Mr. Gooche's and Aitkin's machines, with additional buckles, belts, and ſcrews, but I have only ſcrewed my patient into a ſtate of indiſcribable torture, in which neither he has had the courage, nor I the cruelty to perſevere.

Perhaps there cannot be a more awkward ſituation than that of the ſurgeon, who, truſting the unqualified encomiums of the authors of thoſe inventions, has congregated his carpenters, ſmiths, ſaddlers, and bellows-makers, and ſet them to work! and after ſcrewing his patient into a ſtate of exquiſite torture, is forced with ſhame and confuſion to give up the point, and to lay out the limb ſmoothly upon a pillow to recover from the galling and bruiſing of his machines. It is then only that he begins to perceive the wide difference betwixt ſpeculation and practice, betwixt a machine put about a ſound limb, and a bruiſed and fractured one; it is then he becomes ſenſible how eaſily an untruth may be told in a drawing *.



*Gooches own representation of the maner of aphlying his Machine*

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* Such drawings are juſt indirect lies; the ſurgeon never reflects upon the ſwelled, miſerable, and diſordered condition of ſuch a limb, and the artiſt who makes the drawing knows nothing of theſe matters. The ſurgeon lays down his machine before an artiſt, and ſays, "Draw me that machine:" Then he ſays,

Next in order is the method uſed by Mr. Deſſault for extending the fractured thigh: I wiſh ſincerely I could ſpeak of his invention with a degree of reſpect at all proportioned to the deference I feel for one who was undoubtedly a great ſurgeon, diligent in his practice among the poor in the Hotel Dieu, and kind and encouraging to the young ſurgeons who ſerved under him, and who in return teſtified their gratitude by writing out his caſes and obſervations †. His theory is unworthy of his high character, his intentions, and indeed his very words, are anticipated, not merely by old ſurgeons, whoſe works he might have neglected to read, but by his immediate predeceſſors and contemporaries, Petit, Sabattier, and Duverney. He was in the cuſtom of applying the long ſplint of Duverney with as much anxious preparation, as if he had truſted to that alone, while his peculiar method, that on which he entirely depended, conſiſts in fixing the patient to the head, and drawing down the heel towards the foot of the bed by lacs or bandages fixed round the ancle, a method neither original nor ſucceſsful, not even conſiſtent with the ſplint which he applied at the ſame time.

Firſt, Mr. Deſſault applies round the broken thigh bone (ſuppoſing it broken in the middle) one compreſs above the place of fracture, and one below it; over theſe compreſſes he applies an eighteen tailed bandage, and then taking two long pads or cuſhions, he lays them along each ſide of the thigh; thus far he complies with the rules of the veteran ſurgery, he binds up the fractured thigh with theſe compreſſes and cuſhions to fill the hollows of the ſplints. Next he applies a long ſplint about three inches broad, and reaching from the heel to the haunch, or beyond it, while he lays a ſhorter and ſmaller ſplint along the oppoſite or inner ſide of the thigh. The long ſplint is ſecured by being let in betwixt the folds of a table-napkin bound firmly round the pelvis, while both ſplints are made firm by bands of ribband or tape tied round the whole.

Here there is nothing different from the methods of Heiſter and others, but it ſeems a mere compliance with the cuſtomary practice, he troubles or rather tortures his patient with this complicated apparatus in mere compliment to the old ſurgeons, and then with all poſſible ſang-froid concludes, "That yet nothing can effectually oppoſe the diſplacement of the thigh bone, except ſuch an apparatus as ſhall

"You muſt make me another drawing, and put the machine upon the thigh or leg." And thus, in place of a true repreſentation of a broken and ſwelled leg, with theſe cruel irons and buckles fixed about it, we have preſented to us a limb lying in its gear, nice and tight as a girl in her new boddice.

† This is the manner in which Mr. Deſſault formed his Surgical Journal.

prevent the trunk gravitating towards the thigh, and the leg, on the other hand, being retracted towards the trunk †."

This is the peculiar theory of Deſſault, and the additional apparatus which he next applies he boaſts of as his own invention, and as the conſtant and ſucceſsful practice of the Hotel Dieu for three years ‡. The roller, the cuſhions, and the long ſplint of Duverney being applied, Deſſault is next to prevent the gravitation of the body (or in plain terms the trunk ſinking downwards in the bed), and the retraction of the leg. Firſt, he puts a large folded cloth, napkin, girdle, or roller round the thorax juſt under the arm-pits, to which are fixed thoſe bands by which the patient is tied up to the head of the bed, and the body prevented from ſliding down, from deſcending or gravitating towards the fractured limb. "Next (ſays Mr. Deſſault) nothing is more eaſy than to prevent the thigh being retracted towards the pelvis §," and for this purpoſe the ancle being encircled and defended with a long flat compreſs laid round the back of the leg and round the ancle, the middle of a common roller or bandage is to be applied round the heel, turned round above the ancles, croſſed upon the fore part of the foot where the buckle lies, and tied over the ſole of the foot; this roller carried to the foot of the bed, is fixed there.

Thus does Mr. Deſſault accompliſh that perpetual tenſion of the limb, which he decorates with the fine name, "Permanent extenſion;" but how he can regard this as peculiar to any period of ſurgery, as the excluſive practice of the Hotel Dieu, or as an invention of his own, I am at a loſs to divine. The doctrine (ſince we muſt call it a doctrine) was announced by Mr. Petit in a very formal manner, and he was accuſtomed to fix the lac or ligature, which is deſigned for preventing retraction of the thigh, to the foot of the bed, while a large tablecloth fixed to the top of the bed, and paſſed round the groin, ſupported the patient, and prevented the trunk

† Le ſeul appareil qu'on puiſſe oppoſer efficacement au deplacement des os dans les fractures obliques du femur c'eſt celui qui empêchera le tronc de ce porter vers la jambe et la jambe de ce porter vers le tronc.

DESSAULT.

‡ L'on oppoſa á l'action de ces parties un moyen qu'on emploie depuis trois ans á l'Hotel Dieu et qui y réuſſit conſtamment dans les cas même les plus difficiles.

§ Le bleſſe etoit deja fixé au chevet du lit par des bandes qui partoient d'une large cein-ture placée ſous les aiſſelles et par conſequent le tronc ne pouvoit deſcendre: *il ne s'agiſſoit donc que d'empecher la jambe de remonter vers le baſſin, et la choſe etoit etre facile.* On plaça ſur des compreſſes épaiſſes derriere la jambe et au deſſus des malleoles le milieu d'une bande dont leſs cheſs croiſſes ſur le dos du pied puis noués ſous la plante alloitoient s'attacher aux pieds du lit.

deſcending towards the fractured limb †. There is, indeed, nothing peculiar in the method of Deſſault, except the precautions which I ſhall now mention: Firſt, That in place of applying his bandage for extenſion round the lower part of the thigh, where the veins and arteries being ſubject to compreſſion a ſwelling of the whole limb might enſue, Deſſault applies his lac round the ancle, where, from there being leſs of the bulk of the extremity below the ligature, and the veſſels being defended in ſome degree by the projection of the ancle bones, there is leſs danger of ſwelling. Yet this precaution of Deſſault's is far from being either new or effectual; for Hildanus, when inſtructing the young ſurgeon how to apply theſe very lacs, acknowledges, that though commonly applied round the knee, they may be better applied round the ancle: "Si quis tamen cingulum tibiæ circa talum adaptare voluerit non errabit." But ſhould you incline to apply the lac round the ancle in place of the knee, you may with all propriety do ſo. And Mr. Sabattier (who wrote a paper on the ſubject before this publication of Deſſault's) proves not only that this permanent extenſion has been at all times a very common practice ‡, but alſo that it is a very dangerous one. "The conſequences (ſays Sabattier) of this method, are ſo diſtreſſing, that nothing can perſuade me that it is not very dangerous; for the thigh and ancle are prodigiouſly ſwelled by the compreſſion of the lacs, while the parts are excoriated by the filth of urine and the ordor with which the bands are continually ſoiled; while ſome have ſuffered much from continual fever and irritation, others have died in unſpeakable torments." Theſe are ſtrong teſtimonies againſt this practice, they are plain repreſentations of what Sabattier had ſeen; but they are not mentioned by Deſſault, who with particular addreſs (and I am ſorry to ſay it) diſengenuity paſſes over thoſe teſtimonies, while he quotes Sabattier on every other point, and leaves to us the ungracious taſk of confronting Deſſault's eulogiums on his permanent extenſion with theſe unqueſtionable facts.

† "Le lacq. du genou s'attache au pied du lit pour retentir la cuiſſe en bas, pendant que la nappe qui eſt attachée au chevet du lit retient tout le corps vers le haut, et *l'empêche de deſcendre*; ce qui maintient la cuiſſe dans ſo longueur."

‡ The writings of Sabattier prove that this permanent extenſion was not only a common practice with old ſurgeons, but that it was commonly uſed by his contemporaries, whence he is both entitled to repreſent the conſequences of this kind of extenſion, and to deſcribe the method, which he does in terms expreſsly ſimilar to thoſe in which Deſſault explains the new practice of the Hotel Dieu. "On enferme enſuite la jambe et le pied dans des fanons, et l'on met audeſſus du genou et des malleoles, des lacqs aſſez longs pour pouvoir etre fixes a une planche placée au pied du lit. Le lien qui a ſervé a la contre extenſion eſt auſſi fixe au chevet du lit. Par ce moyen on continue les extenſions pendant une partie du traitement."

Secondly, Mr. Deſſault, as he had removed the lower bands from the knee to the ancle joint, removes the upper band from the pelvis to the thorax. When Petit and other ſurgeons practiced the ſame method, the patient was ſupported merely by a tablecloth or ſheet paſſed round the groin; Deſſault alleges that this would gall the patient, but Deſſault's own bandage round the thorax produces not galling (which a man of fortitude could eaſily bear, which a man in theſe circumſtances muſt bear), but oppreſſion and inſufferable diſtreſs, which no one can poſſibly bear. Of the difficulty of ſupporting the anxiety produced by this ſtricture round the thorax, Deſſault's own caſes give moſt unequivocal proof; his patients often were ſo oppreſſed with their bandage, and breathed ſo difficultly, that he was obliged to ungird them; and in one caſe the relief expreſſed by one of the patients is recorded by Deſſault himſelf in very ſtrong terms, though we may venture to ſuppoſe, that the patient would have uſed ſtill ſtronger expreſſions. Deſſault ſays, that when he exchanged the bandages and permanent extenſion for the long ſplint, the man was no ſooner unharneſſed of the girths with which he was bound to the head and foot of the bed, "than the pain of the thigh ceaſed, and he breathed more eaſily *;" but had the man been permitted to dictate his own page in the journal, he would, I dare ſay, have declared "that he was in heaven the moment he was unbound." I perceive Mr. Deſſault is unwilling to acquaint us all at once with the whole truth; for we find by circumſtances mentioned on another occaſion, that the patient was ſo bound down that they were even unable to ſlip any thing under him to receive the natural diſcharges. His poſture was as terrible as that contrived by the old lithotomiſts, who tied their patients not only by the hands and feet, as we do, but literally hilt to point; for beſides the bandages which faſten the hands to the feet, they had another great bandage which went from the heels round the neck like a cobler's ſtrap, and tied the patient double.

To judge of the merits of theſe methods, imagine to yourſelves the condition of a patient under Deſſault's diſcipline, firſt laid down on one ſide, and bound ſo to the long ſplint of Duverney, that the body and the limb were as one piece; next a great napkin put round the thorax with all the firmneſs of a bandage, ſtraps going round the thorax, paſſing under the arm-pits, fixed to this circular, and the pa-

* A peine fut il debarraſſé des liens qui le tenoient fixé a la tête et aux pieds du lit, qu'il ne reſſentit plus aucune douleur á la cuiſſe et qu'il reſpira plus facilement.

‡ An avoit gagné d'ailleurs la facilité de lui paſſer aiſement un baſſin pour aller à la ſelle ce qui ne s' executoit que tres difficilement pendant l'application du premier appareil.

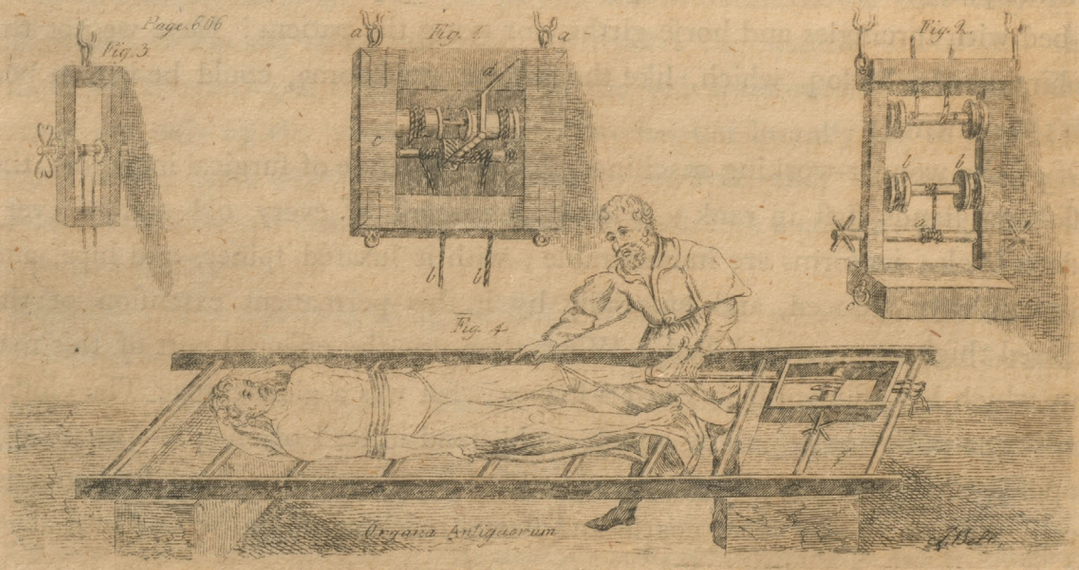
tient drawn up by theſe ſtraps to the head of the bed. Next, imagine two lacs or long bandages, fixed one round the knee and the other round the ancle, one tightened when the other had cauſed excoriation; imagine the patient extended like a malefactor drawn by horſes, bound ſo down to the bed that even a cloth or flat diſh could not be ſlipped in under him, the bands aſſiduouſly tightened the moment they ſeemed to relax, and the thorax ſo bound and compreſſed that he could not breath! think of all this apparatus of bandages, if you can, without holding in your breath as if trying whether ſuch oppreſſion could be endured. I think, for my ſhare, I could as well undertake to live under water as in Deſſault's, I might ſay in Damien's bed.

But why ſhould we argue whether this be an original invention of Deſſault's? for obviouſly this permanent extenſion would be the firſt and moſt natural deſire of the ſurgeon, who would ſay to himſelf, "Now, could I but preſerve the limb *permanently extended*, I muſt ſucceed in performing a cure!" nor, indeed, could any thing but the ſad and painful experience we have had prove to us that a thing ſo deſireable is impoſſible. Have not the ſurgeons of all ages uſed this *permanent extenſion?* Have we not machines and belts innumerable? Have we not the ancient Greek windlaſs and ſhip-block, the invention of Archimedes himſelf, dignified with the title of Gloſſocoma? Have we not the jack-ſtone of Hildanus, which was hung to the heel, and the remora or poſt driven into the floor or table, which fixed the patient in his place, and prevented him ſlipping forward? Have we not the bed with ſurcingles and horſe-girths, for tying the patient? Have we not the machine of Mr. Belloq. which, like the ancient gloſſocoma, could be laid in bed with the patient?

Of all the wonder-working machines, the chef-d'œuvre of ſurgical inventors, the gloſſocoma ſtands firſt in rank; it is the ornament of every old and of every modern book; its forms are innumerable; with it luxated ſpines, and hips, and jawbones, were reduced, and eſpecially by it this permanent extenſion of the fractured thigh was accompliſhed. What, then was the eſſential part of this machine which has aſſumed ſuch various ſhapes, what was a gloſſocoma? The gloſſocome was a pulley or any thing which could ſtand inſtead of one; it was uſually compoſed of four ſtrong pieces of wood nailed firmly together, encloſing an axis, wheels, pulleys, or any other coarſe and ſtrong machinery, and was arrived at its higheſt improvement when it was ſo connected with a fracture-box, that it could be laid in bed with the patient.

Of thoſe engines there ſeem to have been three general forms. 1ſt, The Gloſ-

ſocoma Nymphodori conſiſted of four firm pieces of wood nailed together in a ſquare form; by the rings (a a) it was faſtened to the foot of the bed, ladder, or table, upon which the patient was extended; the ropes (b b) were fixed to the lacs by which the limb was to be extended; the wheels or pulleys (c c c) were worked by the handle (d); and whether a luxation was to be reduced, or a fractured limb extended, this was the engine with which the work was performed. 2d, The Plinthium Nilei conſiſted in like manner of four ſquare pieces of wood nailed firmly together, with merely a ſimple axis or turning ſpoke, with teeth, like thoſe of a capſtan, to prevent it running back. 3d, The Triſpaſtum Apellidis ſeu Archimedes was ſtill the ſame engine, or, as they named it, Organon; but inſtead of the ſimple axis of Nileus, or the pulleys and lever of Nymphodorus, it had both an axis (a) and four wheels (b b), by which the velocities were multiplied and the powers increaſed; it had its rings (c), by which it was fixed to the floor, table, &c. while its ropes were attached to the lacs which fixed round the limb. We find from hiſtory that neither Apellides nor Archimedes were phyſicians, but architects; the gloſſocoma was deſigned for other purpoſes, but was adopted by the phyſicians of former times for the reduction of luxations and fractures, and was modelled, of courſe, on a ſmaller ſcale †. It was the ſhip-block of Archimedes which the phyſicians coveted, and, indeed, the coarſeneſs and force of the machine aſſorted well with their doctrines and practice.




† "Illud imprimis ſcire convenit quod neque Apellides neque Archimedes medici fuerunt ſed architecti qui machinamentum hoc excogitarunt (quem admodum nos accipimus de hiſtoria) ad naves deducendas funi-

Thoſe three machines ſerved but the purpoſe of blocks, capſtans or windlaſs, and were of no uſe till fixed to the bed or ladder on which the patient was laid. If a ſhoulder was luxated, they put a ladder to the man's ſide, thruſt his arm through one of the rounds of the ladder, put the lacs round the arm, and then tied the gloſſocoma or Plinthium Nilei to the foot of the ladder, and put the tackle or ropes to it, ſo as to make it ſerve the purpoſe of a block. Was the thigh bone luxated or fractured, then they converted the ladder into a temporary bed, tied the patient's arms down cloſe by his ſide, and his body to the bars of the ladder, fixed the organon, the machine (whether gloſſocoma or plinthium), to the loweſt round of the ladder, and then proceeded, by the help of this rude tackle, to extend the thigh. This is the operation which I have repreſented in the 4th drawing; and always, whether the hip or the jaw bone was broken or luxated, whether the patient was to ſtand or lie, whether he was to be put to the rack on the ladder, over the top of a door, on the floor, or on a bed, the gloſſocoma was ſome way or other fixed near him, and was of no uſe till it was fixed †.

Such improvements as thoſe coarſe machines were capable of were not long delayed; from being occaſionally fixed to the table or ladder on which the patient was laid, they were ſoon permanently joined with the bed or table, ſo as to form very awful engines! Of this kind was the bench of Hippocrates. It conſiſted of a floor ſix cubits long and two broad; the beams of which it was conſtructed were nine inches in thickneſs, whence you may conjecture what degree of force they expected to uſe; along the ſides of this floor or gallery were planted ſix ſtrong feet or poſts, one at each corner, and one in the middle of each ſide of the platform, which feet ſtood perpendicularly up, and the axis or levers were paſſed through holes in the points of theſe. The patient, laid on his back on the floor of this machine, was tied down to it bodily; and whether the arm was to be reduced, or the fractured thigh, or the luxated ſpine, the lacs being fixed round the limb or round the body, were twiſted by means of the axis, and the phyſician had it in his power to uſe what force he pleaſed, even to the tearing off the limbs. But words can give no idea of this engine of torture. The Scamnum Hippocrates, drawn at the end of this chapter, is more like the drawing

bus non per manus ſed per ergatam attractis; illius autem ſeculi medici ejus ſtructuræ modum minuentes, Triſpaſtum, organum medicinale, ad luxata fractaque reſtituenda fabricarunt." ORIBASIUS, cap. xxiv.]

† "Quoniam tractoria organa imperfecta ſunt nec præſtare quicquam per ſe poſſunt ſed alterius operam requirunt puta SCALÆ LECTI SCAMNI quæ ubi non ſunt, eorum vicem exhibet pavimentum terraque," &c.

ORIBASIUS de Machinamentis.

of a martyrdom, or ſome of the exhibitions in an Auto-de-fée, than of any ſurgical operation. Would you believe it, theſe great phyſicians eſteemed ſurgery ſo highly, as to think it degrading to that noble art to puſh in the luxated jawbone with the thumbs? The man who had his jaw luxated was laid in the bench of Hippocrates, and whether the jaw had ſtarted out on one ſide or on both ſides, he was laid flat on his back, his arms tied down along his ſides and belly, his legs and feet tied together like thoſe of a mummy; the whole man was fixed ſolidly to the bench, and his head being held firmly up by one bandage, which went under the upper teeth, and an oppoſite lac being put into his mouth, ſomething like a bridle round the lower jaw, the two axis or turning handles were ſet to work †. We perceive, then, that there were as bold ſpeculators as ſcientific and ingenious ſurgeons in thoſe days as in our own ‡.

The machines had gone on continually improving, till at laſt the axis was permanently connected with a ſort of trough, in which the broken limb was laid; and this was the beginning of that form of the gloſſocoma which was uſed on all occaſions, whether for fractures of the thigh or of the leg. This kind of machine was a modern invention in the days of Oribaſius §, it ſeems to have been much admired in the days of Paræus and Hildanus, but it is now antiquated, except in ſo far as it has been revived by Mr. Deſſault, for this form of the machine (which is repreſented on my margin along with that of Mr. Belloq.) was not only uſed for extending and reducing the leg, it was meant to maintain a permanent extenſion, it was laid in the bed with the patient. The old authors ſhock my credulity a little when they ſay, "Commodiſſime admovetur," "that it was a pleaſant bedfellow;" for ſure enough, when once applied, it was not taken off in haſte, nor did they allow the patient to forget that it was there; after ſetting the fracture, it was their conſtant care, by turning the axis, to correct the tenſion of the lacs, making them tighter and tighter from day to day ‖. This completes the parallel betwixt the

† "Maxilla excidente ſive ab altera parte ſive ab utraque homo reſupinatur ſic ut caput juxta axem qui ab ejus parte eſt collocetur brachiis ad pectus atque abdomen alligantes cruribus que inter ſe et omnibus ad ſcamnum organum devinctus."

‡ The drawing at the end of this chapter is that of a man laid in the Scamnum Hippocrates to have a luxation of the jaw bone reduced.

§ "Non ab re quidem mihi gloſſocomum videtur *a junioribus medicis inventum*, quod ſeu crus ſeu femur comminutum ſit, ubi callus circumdatur commodiſſime admovetur." Oribasius.

‖ "Sic ut compoſita fractura in poſterum liceat quotidie hanc laqueorum in diverſas partes intentionem corrigere valentius vel levius extendendo."

permánent extenſion of the ancients and that of Mr. Deſſault, who ſays, "Our method has ſeldom failed us; but much of our ſucceſs was owing to unceaſing attention to tightening the bands †." But if theſe bands were thus tightened from time to time, it is a fair logical concluſion to ſay, that they were ſlackened from time to time! that Mr. Deſſault himſelf, with all his formidable bandaging, never did accompliſh a permanent extenſion! This fine name "permánent" could never reconcile me to ſo unnatural and ſevere a method of extenſion, and in this one ſentence Deſſault himſelf proves that it is but a name ‡.

But ſurgeons did at laſt fall upon a method which abſolutely enſured the permanent extenſion; for being wearied with this perpetual turning of ſcrews to tighten the bands round the ancle, they at laſt moſt happily thought of putting a pulley to the foot of the bed, and hanging a good jack-ſtone to the heel. I have (in next page) drawn the bed, the ſurcingle or horſe-girth for the body, and the jack-ſtone of Hildanus for hanging to the heel; and according to my poor conception, the method of permanent extenſion was by this rendered ſo perfect, that Mr. Deſſault could do nothing but diſgrace himſelf by attempting any further improvement. Every ſtep we proceed in this hiſtory weakens the plea of Deſſault to originality, and, what is more important, demonſtrates the folly of all ſuch attempts. If this be not an anticipation of Deſſault, if this girth do not "prevent the body gravitating towards the fractured limb, if this jack-ſtone do not prevent the limb being retracted towards the body," there muſt be ſomething in the theory and practice of Mr. Deſſault paſſing all comprehenſion.

† "Le moyen nous a preſque toujours reuſſi, mais nous devons principallement nos ſucces a l'attention conſtant de referrer le bandage." DESSAULT, p. 365.

‡ Galen, in his Commentary on Hippocrates, deſcribes the uſe of the Gloſſocome thus: "Una axis converſio pariter ambos laqueos extendit, &c. Schæma oſtendit extenſionem femoris diminuti; ſi autem ſit crus diminutum laqueus ſuperior infra genu inferior vero ſupra malleos aliguandus eſt; atque ita crus in diverſa extentum conſervandum." Now, far from doubting that they uſed the gloſſocoma as a means of permanent extenſion, like Mr. Deſſault's lacs, we ſee that the laſt words of this quotation plainly imply that this machine was for making a permanent extenſion. Nay, farther, the uſe of it was univerſal; they put on this machine, as Mr. Wathen would put on his conductor, to convey the patient ſafely from place to place: "Quando patiens ex ſuo lecto in quo jacet, ut ſternatur, transfertur in alium." By the help of it they raiſed the patient out of bed to have it made. I find in another place the following expreſſion: "Si callus fuerit durior frago eum *inſtrumento attrahente in diverſas partes* deinde ſano ut hactenus docui." This implies, firſt, That the Gloſſocoma was uſed for conveying patients ſafely; ſecondly, That in bed the patient lay with the gloſſocoma continually about the limb; thirdly, That the axis was turned continually to counteract every ſlackening of the lacs; fourthly, They even uſed it (as I imagine) for extending ſhortened and decrepid limbs, after the callus had been formed.

Conclusion.—I have laid before you this ſhort hiſtory of various machines, not that you may imbibe from me thoſe prejudices I may have contracted, but that you may judge for yourſelves; and I have delivered thoſe hiſtories in the very words of the inventors, becauſe it is the only fair and impartial repreſentation: "Would you hear it from our mouths or from our maſters?"

Thoſe inventors had little foreſight who ventured to appeal to the ranks of crooked and deformed bones to be found in every muſeum as proofs of the imperfect ſtate of ſurgery †. Alas! what have they done to leſſen the number of the lame and deformed? Their inventions have not been neglected, they took care that they ſhould not remain unknown; yet, have not the machines of Aitkin and Gooch been forgotten in leſs than twenty years? In which hoſpital are they uſed? What private ſurgeon applies them? Who is there to praiſe them? Though each machine was the occaſion of writing a book, in that book only are the encomiums of them to be found. We perceive that Gooch and Aitkin are anticipated by Hildanus; Belloq. by the gloſſocomes of Galen, Paræus, and Veſalius; and Deſſault is anticipated by Petit and by all contemporary authors. In ſhort, the machines of Belloq. Aitkin, and Gooch, the mechaniſts of the preſent day, are more complicated than thoſe of the ancients; the genius and inventions of ſurgeons ſeem to have been much on a level in all ages; we find the ſcience full of ſchemes, expectations and diſappointments; by peruſing the hiſtory of theſe inventions, we really diveſt our minds of thoſe prejudices which we are too apt to cheriſh even while we diſavow them.

† "Habeo inter anatomica mea oſſa femoris ad minimum ſeptem vel octo in cemi collecta quorum nonnulla in medio uno pars verſus coxam fracta et diſtorte curata fuere." Hild. p. 476.

In reviewing the hiſtory of thoſe machines, there is one phenomenon which often preſents itſelf, that always after each diſappointment in uſing the moſt curious machines, ſurgeons have returned to the moſt ſimple practice. This cannot be from indolence or diſaffection to the high intereſts of their profeſſion; it cannot be from the want of a great variety of complicated machines that they return to the moſt ſimple; it is, indeed, in the very moment of the higheſt expectation that we ſee their ſudden turning back to the ſimple practice. The principle of this, I think, lies deeper than would be ſuppoſed at firſt ſight, and is the very argument with which I would cloſe this ſubject.

The reſiſtance by which a limb is ſaved from being retracted is FRICTION; if this friction be all at one ſingle point, it muſt be cruel, but if diffuſed all over the limb, it may be endured. In thoſe ingenious machines which I have juſt explained, there is much ſhow and appearance of power, but it is all concentrated in one or two points; the limb is graſped by two or three circulars; the force is of a kind which the ſoft parts cannot bear; the retracting power (viz. the contraction of the muſcles) is continually acting, while the ſoft parts below the graſp of the inſtrument are ſwelling more and more, and the parts immediately ſurrounded by the circulars are giving way; the bands need to be frequently tightened, the ſide irons and ſcrews need to be lengthened; the whole machine is gradually ſlipping. The ill ſucceſs of machinery which touches but at points demonſtrates to us that ſuch kind of reſiſtance cannot be made permanent like the contractions of the muſcles, which always in the end prevails! the firſt ſlackening of the machine is the beginning of that yielding which allows the inceſſant reaction of the muſcles to prevail by ſlow degrees.

The contraſt of the leg laid out ſmoothly upon a pillow is, with myſelf at leaſt, very perſuaſive, there is no pain, no ſhow of reſiſtance, and yet there is much. Thoſe authors prononunced the higheſt eulogium on the method of Mr. Pott, when they objected to it, "That to lay the thigh out upon a pillow was to do no more than to commit the affair to Nature."

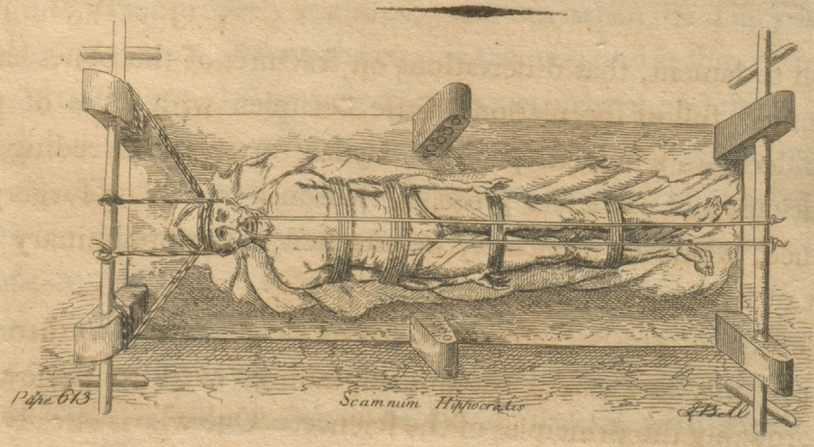
When a limb is ſimply ſtretched out upon a well made pillow, firſt, It is not tortured, and ſo the muſcles are not excited to contract. Secondly, When it is ſtretched upon the pillow, its own weight (ſwelled and lame, and unapt to action, unleſs when excited) fixes it, and every contraction which tends to ſhorten the limb is encountered by a proportioned degree of friction from every point of the outward ſurface of the limb. Thirdly, When the limb is merely extended upon its pillow, the reſiſtance is great; but when, beſide being merely extended up-

on its pillow, it is laid in a well framed caſe, ſtiff, adapted to the ſhape of the limb, bending gently, ſo as to allow of a relaxed poſture, lined with woollen cloth, flannel or fuſtian, to increaſe the friction, and the bend of the ham ſecured by the bending form of the caſe, and each hollow padded up with little cuſhions of tow! another ſplint laid on the oppoſite ſide of the thigh, the whole braced down gently with ribbands, and then both the thigh and its caſe bound to the pillow by tapes! the fracture is at once very ſteady and very eaſy. The reſiſtance to contraction is hardly perceived, becauſe it is ſo generally diffuſed! it is ſenſible only in its effects, not by exciting pain! there is more of gentle uniform reſiſtance than could be derived from theſe torturing machines, which have ſeldom been ſcrewed about a leg without being very ſoon thrown aſide, and much greater than can be procured by that cruel extenſion which Deſſault has decorated with the fine title *permanent*.

I have proved in a former Diſcourſe, that a thigh may be ſafely extended from time to time. In this preſent Diſcourſe it has been obſerved, that what has been called permanent extenſion, is actually an extenſion renewed from day to day. When the thigh is laid in the way now ſuggeſted, we have the fracture always under our eye; we do not go through the cruel and formal operation of extending with lacs and pulleys, and numbers of men pulling upon a broken limb which we are ſenſible we cannot retain in its extended poſition; we ſtretch it gently, model it with our hands, lay it out ſmooth, ſtretch and replace it from time to time. We now find by experience, that where force is required it is uſeleſs, that it is only where force is not required that we ſucceed; we find, that after a gentle extenſion, the limbs of boys and girls, or of women, of weakly ſubjects, and of old people, lie pretty ſteady; we find, that occaſional extenſion corrects every occaſional contraction; we have no difficulty, except in the thigh of a ſtrong and muſcular man; and we find, that after buckling the moſt powerful machines about the thigh of a ſtrong and muſcular man, we are invariably foiled, and obliged to deſiſt. It is only a big unweildy thigh that is much retracted, and we find by experience, that after ſome time, the ſtrenuous contractions of ſuch a thigh ſubſide, its irritable reſiſtance to our gentle extenſion ceaſes, it falls into a quieſcent ſtate, allowing itſelf to be ſoothed and gently drawn out and laid along upon its pillow! I have often obſerved, that a big and muſcular thigh at laſt ſettles down as it were in its place, and takes a ſeat and poſture, ſo that it is not eaſily diſcompoſed by any accidental ſpaſm, contraction, or unwary motion of the patient.

Theſe explanations I owe to you as young and inexperienced ſurgeons, and will venture to foretel, that after being like others ſeduced to uſe powerful machines, to this ſimple proceſs will you at laſt return. The fractured thigh bone ſeems in a ſtrong man to be retracted by natural powers, which nothing but rude force could ſucceſsfully oppoſe; ſurgeons have delighted in force! their machines are but too powerful! We know by experience that the reſolution of man cannot ſuſtain the tortures of a limb extended by machinery for weeks. We queſtion not the power of machinery in extending a fractured limb, but it is much to be queſtioned whether the ſyſtem be able to ſuffer ſuch protracted torture; if it be, it is at leaſt a phenomenon which I have never witneſſed, nor expect to ſee. Wherever extreme violence is required, I hold it to be a ſign that violence will not ſucceed.

It is my privilege, while I deliver the hiſtory of thoſe machines, to expreſs my opinion, to ſay how imperfect I think the principles are, how impoſſible it is to reſiſt the contractions of a powerful and muſcular thigh, becauſe we are limited, not in reſpect of the extending power, but in the properties of the ſoft parts of the limb to which ſuch power is to be applied. I alſo venture to appeal to the bones of muſeums and charnel-houſes in proof of my opinion. Bring me one thigh bone of a full grown man fractured in the neck, and not ſhortened during the cure; bring me a bone ſo united, either before or ſince the invention of modern machines, and I conſent that you torture your patients with ſcrews, rods, belts and pulleys, till you be weary of cruelty, and convinced with Platner, "that the thigh bone fractured in its neck can hardly be preſerved of its natural length."



# DISCOURSE XV.

## RULES FOR THE MANAGEMENT OF SIMPLE, COMPOUND, AND GUN-SHOT FRACTURES, DEDUCED FROM THE PRACTICE OF THE BEST SURGEONS, AND FROM THE DOCTRINES EXPLAINED IN THE PRECEDING DISCOURSES.

We have reaſon to lament, that diſſertations on fractures of the bones have been deſultory, theoretical, full of ſpeculations, little occupied with rules of practice. You will find, indeed, in a didactic poem on Cyder, or on the Breeding of Bees, more ſound, cautious, and particular precepts, than in a treatiſe on ſurgery, which ought to be valued, whatever merit may be attached to the preliminary theories, only on account of its clear and ſimple rules.

From abſolute rules of practice, founded on experience as well as theory, there ariſes a ſort of certainty and confidence not unpleaſing, even to thoſe who have ſtudied very thoroughly the principles of the ſcience. One who is already initiated

into the principles of the ſcience learns perhaps, from ſuch rules, nothing abſolutely new, but he learns in a manner entirely different; things make new impreſſions on his mind, and of thoſe rules which he imagined while ſtudying the theory, he finds ſome refuted and ſome confirmed; little matters aſſume real importance, and he begins to perceive a wide difference betwixt ſpeculation and practice.

One who is deep read in theory only, while he ſeems to underſtand every thing, is conſcious that he can do almoſt nothing; he is acquainted indeed with the principles of ſcience, but is diſconcerted by the mereſt trifles, and is mainly uncertain how theſe principles ſhould be applied. He is a philoſopher handling the tools of a workman. He is like one who, when conducted through the chambers of a great manufactory, comprehends very well the force and effect of the various engines, and the powers which move them; who underſtands the general deſign of the work, and the effects of each individual proceſs; who obſerves each particular workman as he paſſes by him employed in ſome little ingenious operation, ſo ſimple to all appearance that it might be performed by a child: but the philoſopher has only to put his hand to the work, to be convinced that art and ſcience ſhould always go hand in hand, and that without dexterity of the loweſt and moſt mechanical nature, the higheſt mental endowments are of no avail. But I will make no farther apology for inſtructing you in thoſe little particulars of practice, which I hope you are deſirous to learn.

*Simple fracture* is that in which the bone only is broken, the ſurrounding parts but little lacerated, the ſkin ſtill entire; where the parts, being all encloſed by the entire ſkin and muſcles, and kept in contact by the ſwelling, reunite immediately, ſo that the continuity of veſſels betwixt the broken ends of the bone is reſtored. *Compound Fracture*, is that where the broken ends of the bone are protruded through the ſkin and muſcles, which are ſo much lacerated, that though they ſometimes do reunite when properly replaced, yet often, when the injury has been great, they fall into ſuppuration; hence the cure is tedious; and it ſometimes happens that the caries of the bones, the profuſe diſcharge of matter, and the hectic fever and diarrhœa, prove fatal, or force us to amputate the limb. *Gun-ſhot fracture* is that, where, by the ſhock of the ball, the bones are not merely broken but killed, loſe their circulation, and are incapable of renewing their connexion with the ſoft parts; in gun-ſhot fracture, the force and ſhock of the ball is ſuch, that the ſoft parts gangrene and are thrown off in flakes, which is called the ſloughing of the wound! while the bones are deadened, and muſt be exfoliated. The internal ſurfaces, then, of a gun-ſhot wound are fiſtulous, with much loſs of ſubſtance,

gangrenous fleſh, carious bones, and fetid matter; they reſemble the worſt kind of caries, and are very difficult of cure. And, laſtly, *Fracture* with *luxation* is an injury of ſuch a complicated nature, the bones being broken, ſome great joint burſt up, and the capſule and other ligaments all diſordered and lacerated, that there is the utmoſt danger of gangrene, and it is often a doubtful matter whether we ſhould attempt to ſave the limb or ſhould immediately cut it off; for, firſt, the patient, notwithſtanding our well-founded apprehenſions, may be ſaved, and may in ſome degree regain the uſe of the limb, though deformed and weak; ſecondly, he may in more deſperate circumſtances ſave his life by parting with his limb; and, thirdly, he may die from irreſolution! for the ſurgeon though ſenſible of the extreme danger of the caſe, often lingers in expectation of ſaving the limb, till the fever and fatal gangrene come on. This conſtitutes the moſt momentous and critical queſtion in the whole profeſſion of ſurgery.

Such, then, are the definitions of the ſeveral ſpecies of fracture, and the order and ſucceſſion in which I will endeavour to explain them to you; but allow me firſt of all to remind you of certain ſpeculations from which I have ventured to deduce concluſions of ſome importance in practice. We muſt now endeavour to recollect the real condition of the parts.

Callus is not a mere extravaſation or effuſion of an oſſific juice from the ruptured veſſels of a bone, nor a mere concrete, which being diſturbed during its concretion, is altogether prevented from coagulating; nor can thoſe ſlight accidents which have hitherto been regarded by the ſurgeon as ſo deſtructive (and which, to the patient, muſt always be alarming), diſcompoſe the parts, or ruin the proceſs. We have none of the anxieties of the older ſurgeons about the expreſs and immoveable ſteadineſs of the limb, nor would we, like them, endanger gangrene by tight rollers, they uſed to bind their ſplints and compreſſes as firmly in every caſe as if the patient were delirious and ſtruggling.

Callus, ſince it is not a mere concrete, but the work of active and ſecreting veſſels, is a proceſs to be accompliſhed by nature only, and over which we have no power; the veſſels which form the new bone are turgid, and in high action; the veſſels of the ſurrounding parts are alſo full of blood, working their contents onwards, with an increaſed action, towards the central point where the callus or new bone is preparing. This is what makes the ſwelling which we obſerve ſurrounding the fractured part of the bone. When the ſecretion is completed, this occaſional ſwelling ſubſides, and the ſlow ſubſiding of this hard and very firm ſwelling, is the circumſtance which perſuaded the ancients that they had great power over the

callus, that the callus was clumsy at first, and that by the firmness of their rollers, the weight of their leaden plates, and the powers of their attenuating remedies, they made it disappear.

But we have rejected these bandages, we never roll a limb, we both are sensible of the absurdity, and aware of the danger of it. We cannot but remember the melancholy story of the black eunuch belonging to one of the princes of Arabia, "who having fractured his leg near the ancle joint, had it bound up very firmly by the prince's body physician with compresses and rollers above the wound; but from that moment he neglected his patient entirely, except that he gave him strict injunctions not to undo the rollers. From the stricture of the bandage there came on a gangrene of the limb; and though I made no delay (says Albucasis) in undoing the bandages, and the eunuch had immediate relief from his pains, yet so much was the gangrene fixed in the limb, that it could not be stopped, and he perished †." This is one of a few melancholy cases that Albucasis sets up in the most conspicuous part of his preface as beacons for the guidance of young surgeons; nor has there been from his time a single book on fractures in which there are not related dreadful examples of this kind; much as I have always remonstrated against rollers, I remember with horror, that a boy having a compound fracture of his arm (very desperate indeed, but so much the less a proper subject for bandage), I committed him to the care of God knows who, a man, however, in an official situation; he bandaged the fracture with a roller, and at my morning visit I found the fore arm bound more firmly than a mendicant's leg, the black skin appeared through the interstices of the roller, the hand swelled like a boxing-glove, perfectly black, and the cuticle separating; I need hardly say, that the arm fell into total gangrene.

Callus, consisting of active vessels employed in performing a certain secretion, supported by the swelling of the surrounding parts, and protected by the general entireness of the limb, is not to be discomposed by the slight motions of shifting and accommodating a pillow! While a surgeon has any such idle apprehension,

† "Et vidi medicum alium, qui accipiebat stipem apud quendam Ducum terræ nostræ propter medicinam: et accidit eunucho nigro, qui erat apud ipsum, fractura in crure ejus prope calcaneum: et properavit medicus cum ignorantia sua, et strinxit fracturam super vulnus cum pulvinaribus, et astellis strictura forti, et non dimisit vulneri expirationem. Deinde absolvit eum secundum desideria sua. Postea dimisit eum diebus aliquot, et precepit ei, ne solveret ligamentum: et stetit sic donec apostematum est crus ejus, et ipsius pes, et pervenit ad perditionem. Vocatus sum ergo ad eum: et properavi ad solvendum ligamentum: et consecuta est tranquillitas, et evasit a doloribus suis. Verumtamen corruptio jam *confirmata erat in membro*: et non potui refrenare ipsam. *Non ergo cessavit corruptio perambulare in membro, donec periit.*"

he is no better informed than his patient, and will act with no degree of confidence. But to be perfectly assured that the callus cannot be discomposed by any slight shock, it is necessary to consider more fully what is essential to this internal adhesion, this reunion of vessels, this restoration of the natural actions of the part. In any outward wound, all that is internal reunites when closed, nor does any part fail to reunite except that which is not perfectly put together; if there be in the outward seam or lips of the wound any slight suppuration, it is because of some accidental gaping at that point, and it is to prevent such gaping and inflammation of the wound that we use stitches, plasters, the closest bandages, and even varnishing. Could we preserve the outward seam of the wound in as close contact as its internal parts, there would result no ill consequence from the want of cellular substance and living parts on the outside of the wound; but in a fractured bone, the limb being steady, and the skin entire, the internal swelling of itself supports all the ruptured parts in close contact, there can be no occasion for outward bandage, nor any co-operation on the part of the surgeon.

Thence you may imagine how very simple our practice must be. You perceive there is no affectation in a man who is old in practice protesting against all the trumpery of rollers, cushions, splints, and machines for fractures, or in laying out the fractured limb smoothly upon a pillow, to be healed by that process which Nature has appointed, and which never fails.

But this theory and these practical aphorisms are at variance, not only with the

This is the drawing of the boy's gangrened arm mentioned in last page; it represents the condition in which I found the hand and arm the day following the accident. Upon dissecting the arm, which actually dropped off, I found the bones of the fore arm so shattered that it could hardly have failed to fall into gangrene; but with such a bandage round it, it could not escape.

old practice, but with thoſe inſtructions about extenſion and bandaging which are copied from book to book; for though ſurgeons are gradually ſliding into more ſimple and ſenſible methods, it is only through the individual operations of common ſenſe, that a few ſtrong-minded men have in the courſe of practice been enabled to forget the precepts of the ſchool books, and have by their own natural good ſenſe diſcovered the folly of bandages. Syſtem-writers ſtill retain the old deſcriptions and terms of art, of which there is not one that does not imply an abſurdity. Of theſe the moſt conſpicuous are, EXTENSION, COUNTER-EXTENSION, COAPTATION and DILIGATION; what others there may be I hardly remember, but theſe are the moſt magnificent terms, the moſt favoured by the vile pecus imitatorum, who are characterized by Guy de Chauliac as regular birds of paſſage, to be expected at certain ſeaſons, and "which follow each other like wild geeſe, all in a row †." Theſe terms were deſcriptive of operations which were actually performed by the gloſſocomas of the ancients, and by the block and tackle of the modern ſurgeons.

*Extenſion* was the fixing of lacs and bandages upon the lower part of the fractured limb, to which were applied ropes and pulleys, by which the aſſiſtants pulled. *Counter-extenſion* was the reſiſtance which other aſſiſtants made by tablecloths, girths and bandages, put round the pelvis and upper part of the thigh. *Coaptation* was the thumbing and working the ſmaller fragments and the broken ends of the bone into nice contact with each other; but *diligation* was a proceſs which it would take hours to deſcribe, as it took hours to perform! of compreſſes applied round the broken ends of the bone, pads and cuſhions laid along the ſides of the limb, ſplints above theſe compreſſes and cuſhions, with diſtinct rollers for each ſeveral ſtage of the operation ‡. Such practices are, or ſoon will be, totally diſuſed by all ſenſible men, nor will the terms be allowed to remain as memorials of thoſe abſurd cruelties, or as ſtumbling-blocks to young ſtudents, who read about theſe, aye, and about more deſperate operations, which never will be performed again ‖.

† "De imo tamen miror, quia ita ſe ſequuntur ſicut grues unus non dixit niſi quod alter."

GUIDONIS de Cauliaco Chirurgia Capitulum Univerſale.

‡ See the plate, page 495. of bandaged limbs.

‖ I mean certain operations of cutting out tendons and nerves, when entangled betwixt the fractured ends of the bone, or cutting out irregular ſplinters of the bone in fractures of the ribs, ſternum, &c. which I do not chooſe to ſay any more about; only let my pupils beware, that wherever in any book they read about ſuch operations as diſentangling tendons and nerves, by making an inciſion into the fractured limb, they are reading what never ſhould have been written, and never can have been practiſed; no operation of this kind ever has been performed, even by thoſe who are ſo ignorant as to write ſuch directions, and ſo imprudent as to addreſs them to ſtudents and learners in ſurgery.

But I will deſcribe the real operation in plain words, in which there is no occaſion for any ſuch terms as extenſion, counter-extenſion, diligation, rope, pulley, compreſs or bandage! That is indeed rampant ſurgery! Were it poſſible for a limb to require ſuch extenſion, it never could be maintained. When a limb, the leg, for example, is broken, you need no nice and critical diagnoſtic ſigns to diſtinguiſh the fracture by; the broken limb yields under the weight of the body, the patient hears and feels the ſnapping of the bone at firſt, and is ſenſible, when the limb is moved, of that grating of the broken ends of the bone againſt each other, which was in the old vocabulary termed Crepitation; and the ſurgeon, when he begins to handle the limb, is ſenſible of the ſame grating, he perceives by the bending of the limb that it is broken, and there is indeed ſo little difficulty in diſtinguiſhing a fracture, that I have never ſeen a patient who was not ſenſible of his condition, nor heard of a ſurgeon ſetting a ſound limb, *except by deſign.* In ſetting this broken limb, there is no extenſion required but ſuch as common ſenſe would direct you to uſe if you were not a ſurgeon. You lay the patient in bed, and lay the limb on a pillow, or if you deſign to uſe ſplints, you have two long troughs or pieces of paſteboard bent into a hollow form, lined, or rather cuſhioned, with two or three plies of flannel, and with tapes or ribbands, four or five in number, attached to the outſide of one of the ſplints, by which both ſplints may, after all is over, be gently tied together with bow-knots, to be ſlackened or tightened according to the ſwelling of the limb; you alſo ſoak and ſoften the paſteboard a little, that it may take a ſhape ſuitable to that of the limb.

A long ſplint of this kind being laid flat upon the bed by the ſide of the fractured leg, you deſire one of your aſſiſtants to apply his hands broad round the upper part of the limb, and graſp it gently and ſteadily; you take the foot and ancle in the ſame manner in your own hand; you ſlip, perhaps, your left hand under the broken part of the limb, and thus you and your aſſiſtant carrying, or rather ſliding the limb gently along, lay it upon its pillow (which ſhould not be a common one, but rather like a mattreſs or ſettee pillow flat and firm), or upon its ſplint.

Then you begin to lay the limb ſmooth; your aſſiſtant graſps it again by ſpreading his hands upon the thigh or below the knee, with the deſign of extending along with you, not by lifting the leg from the pillow, but rather by ſpreading his hands over it, preſſing it down to the ſplint or pillow, and ſteadying and holding it by the preſſure, while you, with both hands, lift the foot and ancle, graſp them gently but very firmly, raiſe them a very little from the pillow

or ſplint, and draw gently, ſteadily, and ſmoothly, and when you have extended and ſmoothed the broken leg in a manner which you almoſt ſuppoſe agreeable rather than painful to the patient, you preſs it down upon the ſplint, you and your aſſiſtant both keeping the limb ſteadily and gently preſſed down. You keep it flat and preſſed with all your hands till it gets a ſort of ſeat and bed in the pillow; or if ſplints are to be applied, the limb is now preſſed againſt the lower ſplint; the upper ſplint is then laid above it by a third aſſiſtant; you now graſp the limb with your hands on the outſide of the ſoft and moiſtened ſplints; you graſp and model them a little, and when the whole has taken a form, you tie the ſeveral tapes one after another, and after having tied them in a general way, you go over them again one by one a ſecond time and tie them a little cloſer, ſo as to keep the limb agreeably firm.

There is in this deſcription, you perceive, no mention of thoſe high-ſounding terms which were ſo peculiarly deſcriptive of the grand ſurgery of the old maſters; if we muſt retain them in our modern nomenclature, there ſhould be aſſociated with them no ideas of lacs, and pulleys, and aſſiſtants pulling at a fractured limb. Extenſion means, the ſurgeon gently drawing out the fractured member; counter-extenſion means no more than ſome friend or aſſiſtant holding it firm above; coaptation means only the ſmoothing of the limb and graſping the fractured parts in the hands, and preſſing it ſo down upon its pillow or ſplint as to give it a ſort of ſeat; while the diligation is a thing to be quite forgotten. There is much virtue in a word; many a lameneſs, and not a few gangrenes, may be imputed to this term diligation †.

Yet theſe directions, though plain, ſimple, and manifeſtly conſiſtent with common ſenſe and the beſt principles of pathology, will give you little confidence unleſs you be ſatisfied that they can be ſafely applied to each individual caſe, and that no other rules can be applied with good effect.

### RULES FOR THE SETTING OF SIMPLE FRACTURES.

It is manifeſt that a fractured limb needs only to be laid even and moderately

† I here am careful to deſcribe the common operation, and that only; there are certain caſes afterwards to be mentioned, eſpecially of compound fracture with protruſion of the bone, where a more powerful extenſion is neceſſary, but ſtill neither pulleys nor ligatures are uſed, only, the ſurgeon ſometimes twiſts a hand towel round the ancle to give him a ſteadier hold.

ſteady, to be perfectly reunited without our help; but if a perſon were drunk, delirious, or maniacal, it would need to be bandaged! for the ſame reaſon, if a fractured bone be in danger of being moved by the unavoidable motions of the body, or by the natural functions, as reſpiration, it ſurely muſt be bandaged.

1ſt, *In fracture of the* HUMERUS *or* ARM BONE, the patient is not to be confined, he is not to loſe his health on account of this trivial accident; and ſince he is to walk about, the motions of the body and ſwinging of the arm would neceſſarily diſcompoſe the bones, and abſolutely prevent their reunion. The fracture of the arm bone then is to be ſet with two ſmall flat ſplints of paſteboard, lined with flannel and rolled with a roller gently, but not careleſsly applied, becauſe the common ſplints merely tied with tapes would ſlip off, and becauſe the arm hangs naturally away from the body, ſo that it is eaſily rolled.

N. B. When the fracture is near the lower end of the ſhoulder bone, near the condyles, as at (a) (*vide* figure at the head of the chapter), or in what is improperly called the neck, viz. near the head of the bone at (b), it is apt to be more oblique, and then firmer ſplints, a ſteadier bandage, and more careful poſture of the arm is neceſſary; and when it happens that the ſhaft of the ſhoulder bone is ſeparated from its head, the axilla ſhould be filled with a compreſs to keep the bone out and in its right direction.

2d, *When the* FORE ARM *is fractured*, although one bone only be broken, it is eaſily diſtinguiſhed, becauſe the ſlighteſt turning of the hand produces rotation of the RADIUS, and conſequent crepitation, the radius being fractured; whereas, when the ULNA alone is fractured, the change of ſhape is almoſt as great as if both bones were broken. When one bone is broken, the arm manifeſtly cannot be ſhortened, and even when both bones are broken, the general ſurface formed by the two bones and their interoſſeous membrane is ſo broad, that they are fairly oppoſed to each other, and ſoon reunite. The fracture of the fore arm requires two flat ſplints which are to be laid one on the inſide, the other on the outſide of the arm, and in place of rolling the fore arm with a roller, I uſually tie the ſplints with three or four broad tapes or ribbands, each about a foot in length, not connected with the ſplints, but laid upon the table under the lower ſplint when the arm is about to be laid upon it.

N. B. In the fore arm I have remarked two things, firſt, That the hand muſt not be turned in any degree, i. e. it muſt neither be in what anatomiſts call a ſtate of pronation, nor a ſtate of ſupination, but the thumb even with the line

of the Radius, and the little finger with that of the Ulna; and to preſerve it in that poſition, the ſplint that lies on the inſide of the arm muſt be long enough to reach to the palm of the hand, ſo as to keep the wriſt ſteady, and prevent rolling of the radius; and this ſplint, where it is lodged in the palm of the hand, muſt be a little padded and a little bent, ſo as to let the fingers bend eaſily over it.

Obſerve alſo, that the repreſentation I have given of the adheſion and maſſing of parts about a fractured bone, is ſo far true, that the callus is formed, not by the particular ends of each individual bone, but by the whole maſs of bone, inflamed perioſteum, and cellular ſubſtance; whence it often happens, eſpecially in compound fractures, where the maſs of parts engaged in the proceſs is great, or in gun-ſhot fractures, where the arm, from the tedioufneſs of the ſore lies very long extended upon its ſplint, that the ends of the bones are united in one maſs of callus, by which the motion of the radius is hindered, and of courſe the turning motion of the hand is loſt. This produces a more awkward and diſtreſſing kind of lameneſs than you would eaſily imagine, the patient cannot carry any thing to his mouth without turning the arm at the ſhoulder, the effect is the ſame preciſely with that of an anchyloſis of the elbow joint. This maſſing of the bones together, is repreſented in the plans at the head of this chapter, where, in figure 2, the letters (d d) expreſs the maſs of cellular ſubſtance, &c. ſurrounding the bones and generating the callus. I ſaw ſeveral examples of this at Yarmouth in the Dutch hoſpital, where men ſhot through the fore arm had been permitted to remain in their cradles all the time of the cure, their arms lying all the while flat and unmoved, till at laſt they became immoveable.

3d, *In fracture of the* CLAVICLE, *or* COLLAR-BONE, the weight of the arm pulls down the ſcapula, for in fact the clavicle is the only connexion the ſcapula has with the trunk; the ſcapula itſelf only glides upon the ribs, without being connected with them, large muſcles lie betwixt the lower flat ſurface of the ſcapula and the thorax. The clavicle then ſupports the ſcapula and ſhoulder, and when it is broken, the ſhoulder falls foreward, the ſhoulders ſeem narrower, the pain is greater than in other fractures, becauſe the fracture is always oblique, and the weight of the arm and ſhoulder makes the one end of the broken bone fall under or ſhoot paſt the other. The accident is eaſily diſtinguiſhed, as the bone can be felt in its whole length; perhaps there never was a patient ſober enough to know any thing of his own ſituation, who was not conſcious of the nature of the accident that had befallen him when the collar-bone was broken.

This particular fracture is both reduced and retained, by firſt pulling both ſhoulders ſtrongly backwards, and then turning a firm linen roller (*vide* fig. 24, page 140.) round the ſhoulders, croſſing upon the back, ſo as to leave the place of the breaſt where the fracture is, expoſed and open; for this no more requires ſplints nor compreſs than any other fractures, it is only in conſequence of the weight of the arm that the fractured clavicle requires firm bandaging.

*N. B.* This particular fracture is rarely accompanied with wound, nor is there any difficulty in reducing or retaining the clavicle in its right place; but ſometimes it may be uſeful to fill the axilla with a large compreſs in order to ſupport the ſhoulder and to keep it off from the thorax, ſo as to extend (if we may uſe ſuch an expreſſion) the broken clavicle to its full length. When the arm is big and heavy, when the patient has to complete his journey in a carriage, &c. it is proper to add to the figure of 8 bandage round the ſhoulders, another bandage ſupporting the fore arm and confining it cloſe to the body. This ſecond bandage is indeed neceſſary in every caſe, to prevent the ſwinging of the arm and the inavoidable rolling of the collar-bone.

In reſpect of the fracture of the acromion proceſs of the ſcapula, it may be ſufficient juſt to remark, that it alſo is known by a falling forwards of the ſhoulder, and the place of the fracture is eaſily diſtinguiſhed as the bone is ſuperficial. This fracture requires chiefly that the ſhoulder ſhould be puſhed upwards, by which the head of the ſhoulder bone, preſſed upwards againſt the fractured proceſs of the ſcapula, raiſes it to its right place. In this fracture, the ſhoulder muſt be bound firm, and the fore arm particularly well ſupported.

4th, *In fracture of the* STERNUM, the broken bone is moved, not by the motion of the trunk or body, but by reſpiration; at every motion of the thorax the patient is ſenſible of the grating or crepitation of the bones, the ſurgeon feels it with his hand, and hears it by approaching his ear to the breaſt. The motion of the broken ſternum ſoon inflames the mediaſtinum under it, and by degrees the inflammation extends along the pleura and whole of the thorax. There comes on a frequent cough, and during every paroxyſm of coughing, the craſhing of the fractured ſternum is dreadful.

This fracture admits neither compreſs nor ſplints, and yet it muſt be kept perfectly ſteady; to do this, nothing is required but a ſimple ſwathe or bandage round the cheſt, but it muſt be made ſo firm as to prevent the reſpiration being in any degree performed by the motion of the thorax; the motions of the thorax muſt

be entirely ſuppreſſed by the bandage, and reſpiration performed by the diaphragm alone.

*N. B.* In this fracture the motions of the thorax being inceſſant, the reunion of the fracture without bandage is impoſſible; if you fail to apply the bandage, the motion of the bones will raiſe the inflammation to that height, that the patient will be ſuffocated by the general affection of the lungs, or by the effuſion of matter round the broken bone, and the leaſt misfortune that can happen is tedious ſuppurations under and around the broken parts of the ſternum, and caries of the bone itſelf, ſo that it becomes neceſſary ſometimes to apply the trepan. The bandage which we have directed, though drawn very firm, is far from oppreſſive, the patient feels it to be rather a relief; before the bandage is applied, the grating of the bones, the inflammation, high breathing, and terrible cough, are increaſing every moment; but no ſooner is the bandage drawn firm than the crepitation ceaſes, the pain is relieved, the cough and high breathing begin to abate, and by plentiful bleedings and opiates all comes right again, and the patient is ſaved.

5th, *Fractures of the ribs* are like thoſe of the limbs, ſimple or compound, with or without injury of the ſurrounding fleſh; and when there is injury of the adjacent parts, it is by the ribs being driven inwards ſo as to wound the lungs without any outward wound, ſuch as make the inflammation dangerous.

If the fracture be ſimple, of one or more ribs, it is diſtinguiſhed, and hardly diſtinguiſhed, by a ſlight crepitation, the broken ribs being wrought backwards and forwards under the fingers, by the patient being ſenſible of the grating of the broken bones, and by the ſharpneſs of the pain. There is little crepitation, becauſe the ribs are ſo connected with each other by the intercoſtal ligaments and muſcles, that they cannot be diſplaced; each rib ſerves as a ſplint to preſerve the direction of the adjoining ribs. There is no occaſion for ſetting the broken rib for any compreſs, nor for any particular bandage; but to prevent motion, the heavings of the thorax are to be ſuppreſſed by applying a table napkin firmly round the breaſt, as in figure 23, page 140, which, the firmer it is applied, gives the more perfect relief. This is all that is uſually done; labourers and country men, with whom the accident is frequent, do no more, and ſeldom require advice.

When the rib has punctured the lungs, the air is effuſed, an emphyſematous tumor is formed, crackling like a bladder half full of air. There is no poſſibi-

lity of miſtaking the nature of the accident; it may in general be diſregarded, for inflammation round the broken bone ſoon cloſes the opening in the thorax, inflammation in the wounded part of the lungs prevents the farther effuſion of air, the air already effuſed is abſorbed, and the tumor diſappears. But if the effuſion of air continue, the whole body will be inflated, the air paſſing along in the cellular ſubſtance will inflate the ſcalp and eyes, and extends downwards to the thighs and private parts, till by its accumulation about the throat, it almoſt ſuffocates the patient. Small ſcarifications with the point of a bleeding lancet, are required to diſcharge the air, they may be made occaſionally in various parts, they heal immediately. After the cellular ſubſtance is emptied of the air, the point where the broken rib is, ſhould be preſſed with a firm compreſs to aſſiſt the adheſion of the lacerated parts ſurrounding the fracture.

6th, *In fractures of the ſpine*, there is nothing that belongs to the ſurgeon's department, the caſe is purely radical, the ſpinal marrow is affected by the compreſſion of the fractured bones, or injured by the concuſſion, juſt as the brain is affected by a blow on the head; but it is a kind of injury much leſs acceſſible to the ſurgeon's hand. The ſpinal marrow is plainly compreſſed, the patient loſes inſtantly the power of his lower extremities, which are cold, and without feeling, the bladder and rectum are paralytic; the ſurgeon needs to order glyſters daily, and to introduce the catheter. The parts on which the patient lies ulcerate firſt, and then, in ſpite of all poſſible care, fall into gangrene. Such are the ſymptoms, and ſuch frequently the manner of our patient's death; and notwithſtanding the bloody operations deſcribed in books, of making inciſions, finding the fractured or luxated bone, and drawing it out by the ſpines or ſplinters, there is nothing practicable, and thoſe very ignorant directions given upon the higheſt authorities are dangerous to none but boys. The cutting into the fractured vertebra is a dream.

7th, *In fractures of the lower extremities*, there is no occaſion for bandages, for the patient lying in bed, the part is in no danger of being moved. Unleſs you could invent a machine which could enable a patient to walk or ſtand upon his leg, you need none. In all fractures of the leg, then, ſimple as well as compound, you merely lay the limb out upon its pillow or ſplint; nothing but convulſions, delirium, or mania, can endanger the fracture, or require bandaging. In laying a fractured leg, where but one bone is broken, you need be at no pains about the poſture; if the leg lie eaſy, and the patient complain of no pain, all muſt

be right; but when both bones are broken, you muſt be at pains to trace the ſharp line of the tibia with your finger, for that regulates the poſture of the leg. This you cannot do at firſt, becauſe the general ſwelling hides the bone, but you have no fear of altering the poſture of the limb, and you know that the ſubſiding of the ſwelling marks the proper period for aſcertaining the poſture of the limb.

*N. B.* In fracture of the leg, and eſpecially in compound fracture, you muſt be careful to preſerve the right poſture, for the limb is exceedingly apt to change its form from day to day, according to the place that the patient takes in his bed, and the poſture of the limb with regard to that of the body. Two points you will eſpecially attend to, firſt, The heel ſlipping over the end or ſide of the pillow, or, making by its prominence more impreſſion upon the bed or pillow, falls downwards; and when the bones are reunited, it is found that there is a ſlight deviation of the tibia from the ſtraight line; the bone appears a little prominent on the inſide of the leg, while the foot is a little turned outwards, in a lame, or at leaſt a weakly poſture; yet this degree of obliquity, though it cauſes a ſlight awkwardneſs, never cauſes a great deformity. Secondly, The ſtrong muſcles lying all on the back part of the leg, the fractured part is more apt to be bent in the oppoſite direction, ſo that the bones unite with an angle at the ſhin. This cauſes a grievous deformity, and worſe than that, produces a ſhortening of the limb, and a halt in the gait almoſt as remarkable as that which ariſes from fracture of the neck of the thigh bone, and the point or angle where the tibia projects is apt to become a ſore, for it is very eaſily fretted and ulcerated. This is eſpecially to be guarded againſt, and is particularly apt to happen in compound fracture, where the limb being laid in a great caſe, is plaſtered and poulticed, ſo that the ſurgeon hardly allows himſelf to ſee how the bones lie, and has given ſuch a formidable appearance to the diſordered limb, that he is afraid to look at his own work, to clean the ſore, or to move the leg. Two directions then may be uſeful; firſt, Always to pad up the heel and foot properly, ſo as not to allow the heel to ſink, or the foot to fall to one ſide; ſecondly, To be careful always to prevent the leg taking an arched form with an angle at the middle of the tibia; it is impoſſible to keep the foot too far forwards, or, in other words, an angle in which the middle of the tibia was depreſſed was never known to happen.

8th, *But why ſhould a man lie with a broken leg when he can ſit or even move?* Indeed I know of no reaſon; it is often proper that we ſhould ſet our patient's leg ſo as to enable him to ſit, were it no more than that he might receive his friends,

play cards with them in an evening, and linger through his confinement with as little tedium as may be; it is ſometimes neceſſary that a man ſhould be wheeled in a great chair into his office or counting-room to do buſineſs; it is ſometimes abſolutely neceſſary that he ſhould be diverted and moved, for ſome men have, from ſo ſlight a matter as a fractured leg, fallen into incurable hypochondriaciſm.

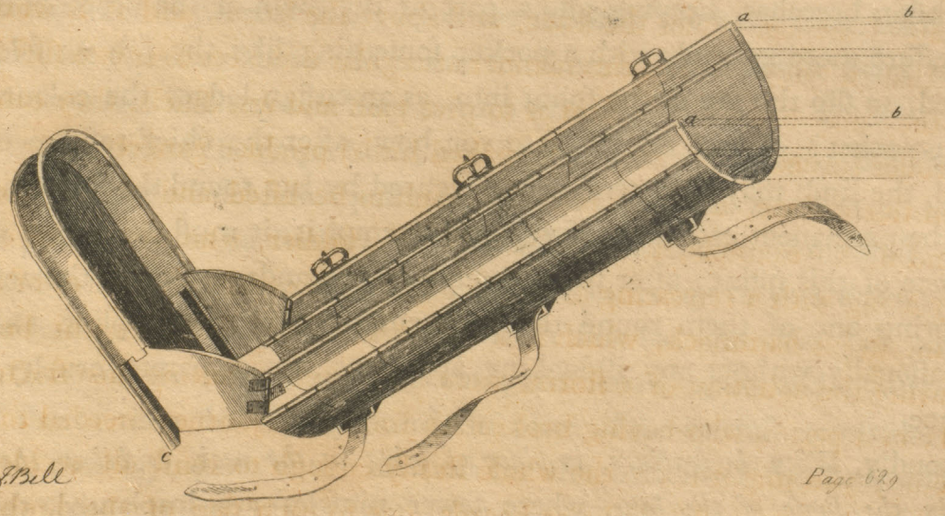
To accompliſh this, the limb muſt be more regularly ſet, and then placed in a box. I do not think rollers or compreſſes neceſſary, and yet they may be uſed, for ſince they are not uſed with the deſign of ſhaping and regulating the callus, but merely of ſteadying the limb, keeping it ſoft, and filling up the hollows betwixt the limb and its box, there can be no danger of their being drawn too firm, yet the rolling with rollers, &c. moves the limb too much.

The proceſs I follow is this: The limb having lain on its pillow for eight or ten days, and the ſwelling being gone off, I lay an eighteen-tailed bandage, made of fine linen, upon the pillow, and lap the tails of the bandage gently round the limb, and the linen being old and worn, makes the limb feel cool, ſoft, and pleaſant; next over that, to increaſe the thickneſs, I lap the tails of an eighteen-tailed bandage, made of fine ſoft flannel, which, were it applied next the ſkin, might cauſe itching and heat. The limb being now ſoftly padded, as it were, with thoſe bandages, is to be laid on a long and firm paſteboard ſplint, another ſplint is to be laid above it, in each ſplint a hole is to be cut for the reſpective ancles to which they are applied, and the two ſplints, extending each of them beyond the knee and ancle, are to be bound very firmly with the ſeveral tapes over the foot, ancle, calf of the leg, under the knee, and above the knee; and it is worth obſerving, that in tying tapes in this manner at regular diſtances over two ſtiff ſplints, though they may be bound ſo firm as to give pain and uneaſineſs, they can never (like a roller turned firmly round the naked limb) produce gangrene.

When this is done, the limb is firm enough to be lifted and moved freely in bed; and if, for example, it were the limb of a ſoldier, who were to be conveyed away along with a retreating army, or ſent to a general hoſpital; or of a ſailor, who lying in his hammock, which is a very narrow and inconvenient bed, perhaps during the agitation of a ſtorm, were in danger of having his fracture deranged; or a perſon who having broken his limb on a journey, needed to be carried home; you might make the whole ſteady enough to reſiſt all accidents, by juſt applying two long flat ſticks or boards, one to each ſide of the limb, above the paſteboard ſplints, binding them firmly like a ſecond ſet of ſtronger ſplints,

long enough to paſs the heel and the knee. Of courſe, ſuch ſplints muſt be applied in the extended poſition of the limb.

But for a perſon, eſpecially in genteel circumſtances, who merely wiſhes to ſit up and be amuſed, a neat ſmall box ſhould be prepared, with a long and firm board, a little hollowed or cuſhioned, to lay the leg upon, a foot-board to reſt the foot upon, moving by a hinge, and occaſionally raiſed or depreſſed, to change the poſture of the foot and relieve the ancle; the ſides of the box ſhould be made with hinges, ſo as to open and cloſe, and ſomewhat concave, or compoſed of thin wood paſted on leather, and then ſplit with a knife, ſo as to bend round the limb and encloſe it firmly. With this box, neatly applied round the limb above the ſplints, the patient can be in no danger from any ordinary degree of freedom. In order to give ſome ſpecific idea of the manner of faſhioning this box, and yet to leave ſome degree of latitude to the ingenuity of the ſurgeon, I give a ſketch of one very old; it is the machine of Guillemeau, the pupil and favourite apprentice of Paræus. Such a machine, with a hinge at the knee, (a) a board to go upwards a little way under the thigh, (b) and with wheels under the heel or angle of it, (c) ſo as to make it run ſmoothly along the floor, may be eaſily contrived. In the military ſervice, or at ſea, the carpenters will, with a few nails and leather, put boards together, ſo as to make a very ſafe and commodious caſe. For a perſon of rank, ſuch a box may be nicely wrought by a joiner while the firſt inflammation and ſwelling of the limb are ſubſiding; and perhaps one or two ſuch machines, neatly made of wainſcot, ſhould be kept in every infirmary.




9th, *But in fracture of the thigh*, there is no poſſibility of riſing, nor indeed of

having any relief, but by that ſlight change of poſture which can be accompliſhed by moving the body, while the thigh itſelf is kept as ſteady as poſſible upon its pillow. Whatever degree of confuſion you may have felt upon reading a hiſtory of the various machines, will be eaſily removed by a few ſimple directions.

Firſt, *When the neck of the thigh bone is broken near its trochanter*, you would not leave the cure entirely to Nature, you would not willingly believe that you can do abſolutely nothing for your patient or friend. When you extend the limb, and find that you have ſo far replaced the broken bone, that you begin to feel the crepitation, you cannot but wiſh to retain it in that place, and you lay large and firm compreſſes upon the trochanter, the riſing of which marks the ſhortening of the limb, and the fixing of which would prevent that ſhortening. Theſe compreſſes ſhould be preſſed very firm by a ſpica bandage rolled round the hip, as it is in page 137. fig. 22. round the ſhoulder. The long ſplint of Duverney muſt next be prepared of ſufficient length to reach ſome way up the ſide, made of firm deal board, declining gradually in ſize, in proportion as the member naturally diminiſhes in ſize, covered well with flannel, that the patient may feel no hardneſs. There muſt be put round the pelvis a very firm bandage like the topband of a pair of buckſkin breeches; and into a ſlit in this bandage muſt be fitted the top of the ſplint. The reſiſtance which is to elongate the limb is to be accompliſhed by the preſſure of the top of the ſplint againſt this circular, and therefore the circular muſt be prevented from being puſhed upwards by a ſtrap going round under the pelvis like that of T bandage; or why ſhould we not actually take the topband of a pair of buckſkin breeches, keeping alſo a part of the thigh of the breeches to make the preſſure more general, with a pocket ſomething like the fob or ſide-pocket inverted, to ſlip the top of the ſplint into, as an enſign lodges the colour-ſtaff in his ſide-pocket? I need not relate to you how, after the chief reſiſtance is eſtabliſhed, the limb may be extended and ſecured by lacs round the knee and ancle; as to the permanent extenſion, if you will attempt it, it muſt be eaſier with the aſſiſtance of this ſplint; after fixing your lacs or bandages round the ancle, you may bring one of them round the lower end or point of the ſplint, and extend it occaſionally without any ill-looking apparatus, any apparent cruelty, or real violence.

Secondly, *When the fracture, in place of being in the neck, is below the trochanters in the ſhaft of the bone*, where fewer muſcles are implanted, the retraction is leſs powerful, but ſtill there is retraction, and the ſhortening of the limb

muſt be reſiſted by the long ſplint of Duverney alone; it is not a torturing machine, does not graſp the limb at particular points, but lodges the whole limb, and gives friction and reſiſtance at every point.

Thirdly, *When the thigh bone is fractured in the middle*, there is no reaſon, even in the moſt muſcular man, to fear retraction, and the thigh may with all poſſible propriety and ſafety be laid ſmoothly out upon a pillow, being careful of the poſture of the body that it be not higher than the thigh, ſo as to gravitate downwards upon it; the thigh ſhould be laid on one ſide, ſhould be laid a little out from the body, and a little higher (indeed the body naturally ſinks into the bed), and the ſurgeon ſhould alſo be careful of the poſture of the heel and foot, for the leg is apt, by its weight and wrong inclination, to turn the thigh upon its axis.

Fourthly, *In fracture of the very loweſt part of the thigh bone, in the part adjoining to the condyles or lower head of the bone*, the fracture is apt to be very oblique; and ſometimes it happens that the bone is fractured ſo very obliquely, that the effect is the ſame as if one of the condyles only were broken away †. In this oblique fracture there is indeed no forcible retraction of the bone, but a continual tendency to obliquity. Very often I have ſeen ſuch a fracture ſo ill cured, that there has been a ſhortening and weakneſs in conſequence of the in-kneed poſture of the limb, which was both very diſtreſſing, and a very great deformity. Then, although there is no occaſion in this fracture for any powerful machine, there is a neceſſity for the perpetual reſiſtance of a very ſtrong ſplint. The leg turns outwards, the ſplint of firm fir board, &c. is therefore to be applied (with proper compreſſes to prevent pain) upon the inſide of the knee joint, and bound very firm with circulars above and below the knee. You cannot bend the leg too much inwards, it always inclines to turn out.

*N. B.* In fracture of the thigh bone, we foreſee a very uneaſy confinement of ſix weeks to the moſt irkſome poſtures, and the eaſe and comfort of our patient are principally to be ſtudied. He ſhould be laid on a hair mattreſs, which is cool and firm, rather than on a bed in which he is apt to ſink down; and it will be of infinite advantage to him to have a fine flat and thin hair mattreſs cut into four or ſix pieces, and the cut parts ſewed again and covered with pieces of ſheet; then firſt laying boards in place of the canvaſs acroſs the frame of the bed, then laying an entire mattreſs for the bottom of the bed, and then laying the ſeveral pieces of the cut mattreſs according to your pleaſure, your

† *Vide* No. 10. of the plans at the top of the chapter.

can raiſe or depreſs any part of the body to any degree, and alter your patient's poſture with the leaſt poſſible motion. If any other pillows be required, they ſhould be the firm and flat hair cuſhions like thoſe of a couch, and indeed the beſt bed is a couch, which friends and attendants can go round about in all directions, which can be wheeled to the window or towards the fire without diſcompoſing the fracture, and which ſhould be placed in ſome public room, where the patient will have as little as poſſible of the feelings of a ſickbed.

You muſt have a hand-rope for the patient to raiſe and move himſelf by without any ſtrain of the limbs or body, urinals and bed-pans for his conveniency, and he muſt have occaſionally anodynes to abate the irritation of his confinement and diſtreſſing poſture, and laxatives of caſtor oil, cream of tartar, lenitive electuary, ſulphur, or whatever ſuits his conſtitution, to prevent the conſtipation which proceeds from opiates and confinement.

10th, *In compound luxation of the tibia and fibula*, in that where the bones are broken, the joint burſt up, the heads of the bones turned out through the wound; the aſtragalus and heads of the tibia or of the fibula almoſt ſeparated, there is ſuch deſtruction and laceration of parts, that we are doubtful whether to attempt preſerving the foot, we can do little more than lay the limb on the ſound ſide, and keep the foot as nearly as poſſible in its natural and proper direction. I have ſometimes ſeen the ancle joint wonderfully diſtorted from being fractured and diſlocated, even without that laceration of the ſkin which conſtitutes the caſe a compound fracture; and by drawing upon the foot very gradually, but powerfully, and working and modelling the diſordered joint in the hand, I have reſtored it to its right ſhape, have ſet it with a firm ſplint well covered with flannel, &c. and bound pretty firm with a figure of 8 roller round the foot and ancle.

*N. B.* In this fracture ſtill the tendency of the foot is to turn outwards, and you have to lay your ſplint along the inner ſide of the ancle joint, making a ſmall window or opening in your ſplint to receive the projection of the inner ancle. By the reſiſtance of this ſplint you draw the foot, which is inclined to turn outwards in a ſplay-foot poſture, inwards into a natural one. It is the proceſs of the fibula that guards the ancle on the outſide, and keeps the foot right; and it is the fracture of the fibula, and the yielding of the outer ancle, that makes the foot fall off towards that ſide.

I mention this luxation here, becauſe it is the only luxation where the head of the bone being replaced does not remain, it is the only luxation that needs to be bandaged as a fracture.

11th, *In fracture of the patella*, the chief difficulty is to preſerve the bones in perfect contact with each other, inſomuch that Dr. Hunter, unable to account for the difficulty of accompliſhing a perfect cure, imagined that the failing of the uſual proceſs in this particular inſtance could be owing to nothing elſe than ſome part of the membranes ſurrounding the joint falling in betwixt the two bones, ſo as to prevent them coming into proper contact.

In this particular fracture the leg muſt be kept extended to the utmoſt; the upper piece of the fractured patella, which is retracted to a great diſtance above the knee, muſt be ſmoothed and thumbed downwards, and put in as cloſe contact as poſſible with the lower fragments. To put it in cloſe contact is the difficulty; it ſeems to be in cloſe contact at the time of your operation, and you are only convinced that the pieces have not been in contact when the cure ſhould be complete; for when the ſwelling has ſubſided, when the patient begins to walk, a hollow is ſeen betwixt the two ends of the bone, and a ligament of ſome length is felt uniting them. The patient loſing the pulley-like projection of the patella or rotula (and the extenſor muſcle being ſhortened), is never able to ſtand on one leg, never able to bear up the body on that limb, never able to mount a ſtair without carrying that leg before, and is never out of danger of forgetting himſelf, truſting the weight of the body upon that limb, falling backwards, and ſo breaking the other patella, or ſnapping the ſame one a ſecond time, as I have ſeen happen very often.

To preſerve the bones in abſolute contact, and prevent this imperfection in the cure, is almoſt impoſſible. The ſwelling, before you are called, is ſo great, that in many caſes bandage cannot be applied for ſix or eight days. When the ſwelling is gone, the pieces of the bone cannot be made to approach each other, nor can the bandage, from the remains of the general puffy ſwelling, be applied cloſe to the bones. The bandaging has been attempted in various ways. The common bandage is a belt of leather ſplit like the common leather retractors, with a ſmall opening in the middle of the ſlit (a, figure 1ſt) for receiving the patella; each of the ſides or ſemicircles of this opening is padded up with leather (b b), ſo as to make a pretty firm compreſs of a circular form; and when the bandage is buckled round the knee, and drawn firm, the two ſides of the ſlit are of courſe drawn ſo cloſe together, as to preſs the two pieces of the patella betwixt them.

If you are in the country, where no ſuch bandage is to be procured, you may,

with fully as good effect, bind the broken patella in the following manner: Firſt, If you have to carry your patients any length of way, I do not know of a better bandage than a hand towel, or ſomething nearly as thick, put round the knee thus like a figure of 8; nor indeed can any thing perhaps be preferable as a permanent bandage. Having carried your patient home, and laid him in bed, you firſt take a thick, flat, and very long ſhaped compreſs, which is to ſerve as both compreſs and bandage, and which of courſe muſt be a yard and a half in length; you lay the middle of this compreſs over the upper or aſcending part of the patella, and you preſs it down upon the patella with both hands; you then bring it round the thigh above the knee joint, then croſs it behind under the ham (as in figure 2d), then croſs it again upon the fore part of the knee, and then ſecure it. The ſecond part of your operation is performed thus: You take a very long and firm linen roller in your hand, you proceed to thumb down the patella into the cloſeſt contact poſſible with the loweſt piece, perhaps you put another compreſs over the upper broken piece, and your roller being a two-headed one, you take one head of the roller in each hand, you preſs the middle of it firmly down upon the compreſs, then your aſſiſtant preſſes the thumbs of both hands upon the upper piece of the patella, with the deſign of puſhing it very cloſe down, and when he has puſhed it as low as poſſible, you make your firſt turn of the roller under and behind the ham, to ſecure what he has gained, and you continue at your own diſcretion turning your double-headed roller in figure of 8 round the joint as long as you think you are gaining any thing in reſpect either of cloſeneſs or ſecurity.

But I have often been inclined to think, that the thicker our compreſſes and bandages are, the more are they inclined to ſlip, as, for example, in reducing a luxation, where the lacs and bandages put about the leg or arm are ſo clumſy that they cannot but ſlip. Perhaps then it would be as well, if, inſtead of this clumſy compreſs, we were to take a ſmaller compreſs of about three fingers broad, and not quite the length of a finger, and connecting it with a ſhort roller like a tourniquet compreſs, apply it over the upper or retracting part of the patella, and ſecure its place by pinning the roller, juſt as you do that of the tourniquet compreſs. Next, it would be well to take a broad two-headed roller, lay the middle of it over the compreſs, and make one or two turns in figure of 8, depreſſing the patella, and aſcertaining its poſture ſtill further, but without putting any clumſy thickneſs of bandage round the limb. Then (the part being in ſome degree ſteadied) I would take two bandages of an ell long, and lay them along, one along the inſide, the other along the outſide of the limb, the one end of each band is laid up along the thigh, and the other down along the leg; I would then begin the application of that roller, by which I meant to ſecure the upper part of the bone, I would take a thin, but very firm linen roller, ſingle-headed, and ſeveral yards long; I would turn it round and round the lower part of the thigh, juſt above the joint, immediately above the bone, ſo as to take a firm hold of the bone above the condyles, embracing the longitudinal bandage at the ſame time, and this roller ſhould not be very broad, leſs than a hands-breadth. This circular roller being thus applied, and having a firmer hold of the patella, and being ſo tight, that upon pulling it down, the patella will be pulled down, you turn down the upper end of the longitudinal roller, or that which lies up along the thigh; and the longitudinal roller lying thus under the circular one, embraced by each turn of it, when you pull upon the longitudinal bands, you draw down the circular bandage, and thus depreſs the upper broken piece of the patella, till it almoſt meets and touches the lower piece; and as there are two longitudinal bandages under the circular (one on each ſide), you may carry the two longitudinal bandages under the ſole of the foot and tie them together. To give a more complete pull upon the patella, you might, if you pleaſed, lay under the turns of the roller a third longitudinal bandage exactly in the middle, which being tied like a ſtirrup under the ball of the great toe, would perfectly preſerve the extended poſture of the limb †.

† This manner of bandaging is explained in figure 3d.

*N. B.* Before applying theſe rollers, they ſhould be all ſoaked and wetted (beſt in ſpirits) to make them ſtick cloſer to the fleſh, and if (having applied them) you are perfectly ſatisfied with their operation, you may eaſily convert them into a firm caſe, by taking a glue-pot and ſoaking them with glue, ſo that each turn of your roller would ſtick to another, and the whole to the fleſh, the knee being thus encloſed in a very perfect caſe. Both during the cure and for ſome time after the patient begins to walk about, I find it convenient and ſafe to ſtiffen the joint, by laying a ſtrong ſplint behind the ham, leſt the patient ſhould make a falſe ſtep, and the knee yield before the ligament joining the bones were become ſtrong.

*N. B.* Though I prefer ſimple and moiſt rollers, which ſtick thus cloſe to the parts, yet there is no doubt that the clumſy compreſs-like roller contorted round the knee in the form of figure of 8, has ſometimes ſucceeded remarkably well. In proof of this, remember what Meibomius reports of a cow-herd, who having broken his knee pan, made a very perfect cure by twiſting round it a firm ſtraw-rope.

12th, *In fracture of the Olecranon* (which is another exception to the general rule of keeping a fractured limb gently and pleaſantly bent), you muſt keep the arm completely extended, for the triceps muſcle pulls up the olecranon to an incredible degree, it mounts abſolutely half way up the arm, and although you thumb it down again, yet if you keep the fore arm in any degree bent, the interſtice betwixt the end of the ulna and its broken proceſs will be filled up with bone, and the fore arm be ſo far anchyloſed, that the patient will never be able to extend it, for this filling up of the interſtice will be juſt equivalent to the lengthening of the ulna.

In ſetting this fracture, you thumb down the retracted olecranon, which is broken away from the end of the ulna, and you completely extend the fore-arm ſo as to make the end of the ulna meet its broken proceſs, you cover the broken proceſs with a compreſs, and fix it with a double-headed roller, turned in form of figure of 8 (as in bleeding), making occaſionally turns purely circular round the broken part, and you make all ſure by laying a ſtiff ſplint in the bend of the arm, and fixing it with a ſecond roller in order to prevent the arm being thoughtleſsly bended; indeed, nothing in ſuch caſes ſhould be truſted to the diſcretion of the patient.

*N. B.* In this fracture there is abundance of callus: there is no danger of that imperfect and ligamentous union which takes place in the broken patella, nor

is there any danger of that profuſion of callus, running like molten lead, into the cavity of the elbow joint, which was ſuppoſed to happen, and to occaſion anchyloſis. When this fracture has been neglected or ill ſet, the fore arm kept at right angles with the arm, and the perſon lamed perhaps in his right arm, it has been propoſed to make inciſion to cut out the intermediate callus, with the deſign of ſetting the bones properly with the arm extended; an operation which is ſurely not impracticable.

13th, *The rupture of the Tendo-Achillis, or great back tendon of the leg*, more juſtly ranks with fractures than with lacerations; for while it was conſidered as a laceration of a ſoft part, it was actually the practice of ſurgeons to ſew the ends of the tendon together with great embowelling needles; but now being ranked with fractures of the bones, it is ſet like a broken bone, like the fracture of the patella, for example, and the ſurgeon has no care but merely to ſmooth down the muſcle, to prevent the retraction of the tendon, to preſerve the ruptured parts as nearly as poſſible in contact with each other.

The tendo-achillis is broken as the patella is, not by a blow or fall, but by a ſudden and violent exertion of its own muſcles, in conſequence of making a falſe ſtep, the patient being inſtinctively incited to make an exertion too ſudden and violent for the tendon to withſtand it; an exertion which ſometimes, in place of tearing the tendon, breaks the heel bone. When the tendon is broken, the patient, from its inſenſibility, feels no pain, he feels as if he had been ſtruck a ſmart blow with a ſtick; it commonly happens, in dancing, or in making a falſe ſtep, as in ſlipping, though not unfrequently it happens when walking apparently ſecurely on even ground; the patient inſtantly falls down lame, the ſhortening of the bellies of the gaſtrocnemii muſcles, the retraction of the tendon, and the interſtice between the two ends of it are perceptible, and the patient himſelf is conſcious he has broken the tendon.

For ſetting this ruptured tendon, various machines have been invented, and eſpecially various ſhoes with ſtraps and buckles behind to draw up the heel, while the upper part of the tendon, on the other hand, is preſſed downwards. According to my experience, this extenſion of the toe and drawing up of the heel are unneceſſary, the foot may be ſafely left in its natural poſture; it is chiefly important to prevent the ſlighteſt contraction of the gaſtrocnemii muſcles; for this purpoſe, the calf of the leg ſhould be ſmoothed downwards with the hands, the whole of the calf of the leg from the ham downwards muſt be rolled with a firm

roller, proceeding from above, but the bandage ſhould not paſs the biggeſt part of the calf, nor at all approach the ruptured part, nor even the inflammation and ſwelling which ſurrounds it.

*N. B.* The chief danger in rolling the leg in rupture of the Tendo-Achillis, conſiſts in approaching the part actually fractured. I was once called to a gentleman whoſe whole leg from ham to heel was firmly bandaged with a roller, the turns of which made deep impreſſions on the ſwelled ancle; and at the point where the tendon was actually ruptured, the turns of the roller (ſo firmly was it drawn) had ſunk down very deep indeed betwixt the ends of the tendon, they were thus ſeparated to a great diſtance from each other, there was no poſſibility of their uniting, and had they been left ſo, the old gentleman muſt have continued perfectly lame. It was on the fourth day after the accident that I was called and undid this bandage, yet the cure was in the end tolerably perfect. The muſcle ſhould be well rubbed and ſmoothed down, and neatly rolled, the ancle and cellular ſubſtance ſurrounding the ruptured part ſhould be left perfectly free, the foot ſhould be ſteadied, but kept quite on the level, the toe neither pointed downwards nor upwards, but the foot kept at right angles with the leg. Mr. Robbard ſurgeon (I believe) at Ipſwich, was ſo bold and ſo honeſt, as to make the experiment firſt on his own perſon, of juſt tying down the gaſtrocnemii firmly, but ſtill continuing to walk about all the while the tendon was reuniting. This I dare no more approve of than the firm bandaging of the ruptured parts.

The tendon is generally a little knotty, eſpecially when firſt united; ſometimes it adheres ſo to the ſurrounding parts, as to make the joint ſtiff; and always the tendon is a little lengthened, and the muſcles of the calf ſomewhat contracted, ſo that the calf of the leg ſeems to have ſhrunk upwards towards the ham.

## CONCLUSION.

In this ſection, conſiſting altogether of rules, which ſhould be perfectly minute, I fear there muſt be many omiſſions which I ſhall hardly be able to compenſate for in the following general obſervations.

Firſt, It is uncomfortable for the young ſurgeon not to know at what period he may venture to undo the apparatus in any particular fracture; for this reaſon, though there can be no ſpecific nor abſolute rule, yet ſurgeons have been at pains to mark the period in which they ſuppoſe each individual fracture to be healed.

Without warranting the propriety of theſe rules, allow me to mention, that authors ſay, the ſmaller bones, as the Clavicle, the Ribs, the Fibula, are cureable in twenty days; the bones of the Cubitus or Fore Arm, the Radius or Ulna, are cureable in thirty days; the fractures of the Shoulder Bone or Thigh Bone require fifty days to reunite; though, to be perfectly reunited and ſtrong, the fractured Thigh Bone requires ſeventy days. But rules ſo ſpecific as theſe, mentioning the very day on which a fracture may be ſuppoſed to be cured, cannot be uſeful without being underſtood. Allow me then to obſerve, that as it appears to me the proceſs is either ſlower and more imperfect in children, or at leaſt, in children the bone is more apt to be broken again: We cannot indeed wonder at callus being ſlowly formed, ſince the bones themſelves are ſtill incomplete and growing for two-and-twenty years: In fractures then happening in children, you keep the roller and paſteboard ſplint longer applied. Nor is it from the ſlow formation of callus that the cure is delayed in fractures of the great bones; the proceſs is not ſlow in proportion to the greater maſs of bone that is to be formed! perhaps a callus will form as rapidly round the bone of an ox as round that of a boy, and be as ſpeedily completed in fracture of the thigh bone, as in fracture of the radius, for every part has veſſels proportioned to the maſs of callus that is to be formed; but the cure is ſlow in proportion to the ſize of the bone, from the larger bone having to ſupport a greater weight; or rather the maſs of callus is ſlow in acquiring firmneſs proportioned to its ſize, or to the weight it has to bear. It is for this reaſon that we are cautious of truſting the weight of the body too early on a broken limb; in fracture of the humerus, as the arm hangs and does not neceſſarily carry any weight, the patient may leave off his ſplints in ſix weeks; but in fracture of the thigh bone, which has to bear the whole weight of the body, we dare not expoſe the unconfirmed callus under ſuch preſſure, till fully three months have elapſed.

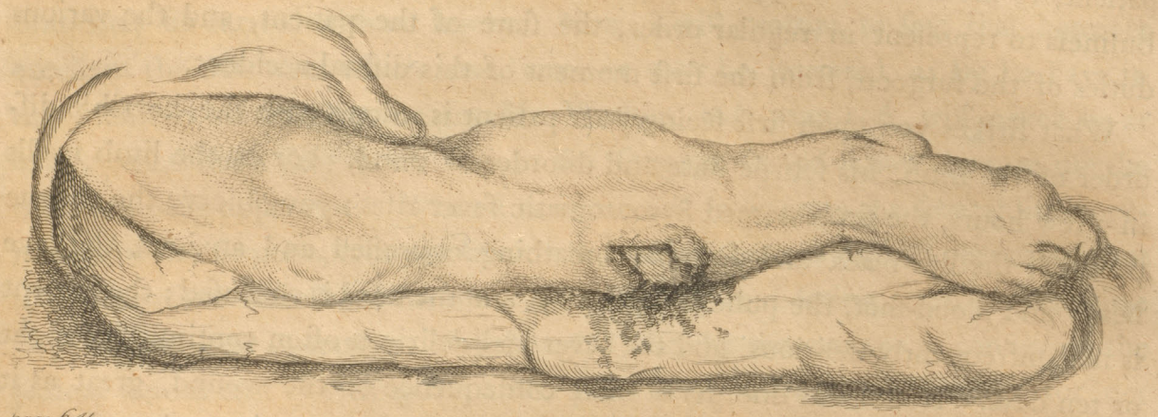
Allow me alſo to obſerve, that on particular occaſions, particular precautions muſt be taken; that while a man is in his ſound health and reaſon, no bandage nor ſplint is required in fractures of the lower extremity; but that when a man is maniacal or delirious, beſides the ordinary precautions of ſplints, the limb, after being ſet, muſt be laid betwixt two pillows, tied to them, and the pillows in their turn faſtened to the bed; that when a man has to be carried far with a fractured limb, beſides being regularly bandaged with ſplints, there ſhould be laid along the ſides of the limb, above the ſplints, long and firm pieces of wood band-

aged like the ſplints, and extending beyond the heel to prevent accidents. And finally, that in the ſea ſervice, and in the army, when either an army is to retreat, or an hoſpital to be moved, or when a ſtorm is expected at ſea, the ſurgeon ſhould be as carefully advertiſed of the approaching ſtorm, or of the preſent movement of the army, as any higher officer, for he has many precautions to take for the ſafety and comfort of his men.

The ſurgeon when he wiſhes to make any part or bandage particularly ſecure, has it in his power to convert his rollers into a firm caſe, either by ſoaking the bandages in whites of eggs, which ſoon hardens in a very firm varniſh; or with the whites of eggs may be mixed a little flour and ſugar to make it into a paſte, or he may apply any common varniſh over his bandages, as white ſpirit varniſh, but that is ſlow of fixing, and is very thin, or he may ſtrew a little powdered roſin on his bandages before they are applied, and then by ſoaking the bandages with ſpirits of wine, the roſin is diſſolved, and the whole adheres to the limb with very ſingular firmneſs; or finally, the bandages may be ſoaked with fine and well made glue, which makes a very firm caſe, and is very far from being offenſive.

Theſe methods are all of them more cleanly, leſs cumberſome, and indeed I think more effectual than the old Arabian method of bedding a fractured limb in ſtucco or Paris plaſter.

Laſtly, I would obſerve, that though in a fracture of the leg or thigh bone, or of the patella, ſplints are quite unneceſſary during the cure, yet when the patient riſes from bed, reſts the weight of the body on the fractured bone, and begins to be expoſed to accidents, light but firm ſplints ſhould be laid alongſide of the limb; while he wears thoſe ſplints he is in a manner under your controul, will walk with reſtraint, and be careful of uſing dangerous freedoms with the limb, and thus he may be ſaved from a ſecond confinement more terrible than the firſt, as it is incurred by precipitation and raſhneſs.



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Perhaps there is no ſight more ſhocking, or that more particularly impreſſes us with the idea of irremediable deſtruction, than what we call a compound fracture; a mangled limb with the bone protruding ſome inches, the wound through which it protrudes lacerated and ragged, the ſurrounding ſkin black and livid with ecchymoſis or extravaſated blood; the whole limb ſwelled enormouſly, even in the courſe of a ſingle hour; and the patient with his mouth parched, his eyes heavy, and his head confuſed, he is, indeed, often delirious with fear and ſuffering. But the ſurgeon dilates the wound a little with his biſtoury, reduces the bone, compoſes the limb, and brings the integuments cloſe, ſo that what ſeemed a terrible laceration, appears to be but a wound of very moderate length. The limb which was before ſo diſtorted, that the foot lay altogether on one ſide, lies now right and even; the blood which was ſtreaming from the limb or caked about it, is now cleaned away, and a piece of clean lint laid upon the wound, and though ſuch a caſe is never without danger, the aſſiſtants and friends are ſenſible that a ſituation apparently very deſperate (and certainly fatal without help), is ſoon converted, by the care of the ſurgeon, into a ſtate of hope and expectation.

You will eaſily perceive, that in an injury varying ſo much in its circumſtances, there muſt be an infinite number of nice and curious operations to perform, of ſtretching the limb, dilating the wound, reducing the protruded bone, and taking away the ſplinters, ſtopping the hæmorrhagy, and laying the lips of the wound in contact; and you will naturally imagine, that where there are ſuch complicated injuries, ſuch laceration of the ſoft parts to heal, and ſo much bone to be reproduced, the ſuppurations will be often very profuſe and the cure long delayed; and that during ſuch tedious cure, you muſt have much to do for your

patient, to moderate the ſuppurations, and to preſerve his health. It ſhall be my buſineſs to repreſent in regular order, the ſtate of the patient, and the various duties of the ſurgeon, from the firſt moment of this diſmal accident.

What ſtrikes you upon firſt ſeeing your patient is, along with the horrible diſorder of the limb, his febrile ſtate and diſorder of mind. For as the limb ſwells in a few hours, the fever named Symptomatic fever riſes; you obſerve the tongue parched, the lips black and dry, the breathing oppreſſed and anxious, the eye heavy and blood-ſhot, the pulſe is thumping, and the head is confuſed; the patient is not unfrequently delirious, and the fever and delirium often continue for eight or ten days. Nor is this diſorder a mere conſequence of the wound, great as it is, for you will obſerve by the wild countenance of the patient, that there is as much diſorder of the mind as of the body; perhaps, he has, upon the cry of fire, awoke from ſleep, and thrown himſelf in the utmoſt terror from a window, his limbs are terribly ſhattered, and when he recovers the uſe of his ſenſes, he finds himſelf carried by perſons unknown to him through the confuſion of a midnight mob; what recollections of friends left in circumſtances of danger muſt then ruſh upon his mind, it is needleſs to mention. This general ſhock then to the bodily frame and to the ſenſes, is ſucceeded by coldneſs, ſhivering, trembling, and confuſion of mind; the delirium ſometimes begins from the very firſt moment of the accident. This ſhivering marks the commencement of the fever; this previous ſtate of coldneſs requires that the patient ſhould be laid in a warm bed, that warm flannels ſhould be applied, that he ſhould have a little warm wine or other cordial, that he ſhould have a doſe of laudanum. If the patient is to be bled, it is only when the pulſe, at firſt trembling, becomes full and thumping, when the face fluſhes, and the eyes become inflamed; in ſhort, during the firſt trembling and diſorder the patient muſt be comforted by cordials, it is only after ſome hours that he can be ſafely bled, though the vulgar after every accident are in haſte to bleed.

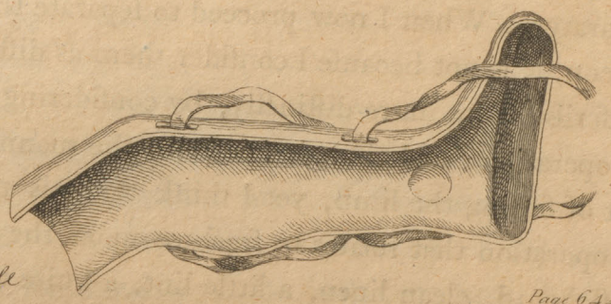
### OF CARRYING THE PATIENT.

Your firſt care is to have your patient carried with as little injury as poſſible, and if you have but a little dexterity and recollection, he can be carried with none; for unleſs it be a ſoldier who has his thigh bone broken in the field, and who is carried off by his companions in their arms, or a ſailor whoſe leg is broken by ſhot, ſplinters, or the recoil of guns, and muſt be carried down a

ſucceſſion of gangways by the boatſwain's crew, every perſon having a fractured limb may be carried without injury. Now, I will venture to ſay, that however excellent the machines which have been, or may be invented, as by La Faye in the Memoirs of Surgery, or by Mr. Wathen, *vide* page 596, will never be at hand, and though they were, it is fit the ſurgeon ſhould know how to uſe the moſt ordinary apparatus. When I now proceed to ſeparate the ſeveral little operations of the ſurgeon, it is not becauſe I conſider them as diſtinct operations, but that I expect to deſcribe them more diſtinctly, by conſidering them as ſucceſſive ſteps of one great operation; and though I deſcribe the manner of conveying the patient before that of ſetting the limb, yet I think there is no apology for not performing every operation that relates to fracture upon the ſpot, ſince nothing is required but paſteboard, clean linen, a little lint, a knife to make any dilatation of the wound that may be neceſſary, and the fingers alone are beſt for hooking out and diſengaging the looſe bones.

The moment you arrive at the place where your patient lies, you muſt proceed to extend the foot, while your aſſiſtants hold the limb, and by pulling firmly, ſteadily, and, remember, very ſtrongly (for in this caſe a good deal of extenſion is required), you get the bone to go back within the integuments, and though perhaps you do not get the bone and the edges of the wound arranged exactly to your mind, you get the foot reſtored to a right direction with regard to the leg, the bone tolerably covered by the integuments, the patient relieved in ſome degree from the pain of this protruſion, and the whole member put in ſuch a poſture that you can lay it on a ſplint as a ſafeguard. There are two forms in which the compound fracture uſually preſents itſelf, firſt, when the patient having leaped or fallen from a height, the bone is merely broken, and protruded perhaps to the length of ſome inches, then the foot being extended and the bone reduced, you, after laying ſcraped lint upon the wound (which preſently cakes with the blood), lay it upon a ſtiff ſplint made of fir board properly covered and padded with cloths, to which the limb being fixed by broad circulars of any common ribband gently tied, and with proper folded compreſſes put for ſoftneſs under each of thoſe circulars, the whole becomes pretty firm, and can be carried with ſafety; but if the fracture have been produced by the cruſhing of machinery, or by a loaded waggon paſſing over the limb, the bones are ſo cruſhed and deſtroyed, and the whole limb ſo reduced to a maſh, that you ſhould rather, after applying ſmall cuſhions of lint to the lacerated wounds, lodge the diſordered limb

in a caſe, and for this purpoſe the ſurgeon ſhould be provided either with large tin caſes lined with cloth or leather, or ſhould have by him ſome of thoſe conductors of Wathen, which are made of bend leather exceedingly hard glazed and varniſhed, in the ſhape of a large boot, cut perpendicularly through the middle, and large enough to lodge a ſwelled and diſordered limb.



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The limb being laid on a firm ſplint, or in ſuch a caſe as is here repreſented, the patient is then to be laid on a mattreſs, which may be placed upon a window-board, a door, a ladder, &c. for theſe are commonly uſed by the country people on ſuch occaſions. It has been the fate of ſeveral men of our profeſſion to have their limbs thus fractured. Pott is not particular in mentioning the manner in which he had himſelf conveyed to town when his leg was fractured; but Paræus relates the misfortune which happened to himſelf with all the intereſt natural to the occaſion, and with the unſcrupulous and tedious minuteneſs of the old ſtyle. He was called, with two other phyſicians, to viſit a patient not far from Paris, but they had to croſs the Seine, and Paree wanting his horſe to go into the boat, ſtruck it on the crupper, when immediately the animal laſhed out behind, and broke both the bones of his leg, when, partly from the agony, partly to avoid a ſecond blow, he tumbled forwards into the boat, his leg bent under him, the bones protruded, and in this condition, and with a degree of pain which you almoſt feel when you read his deſcription, was carried to the further ſide of the river to have his limb ſet. The deſcription of his ſufferings when he was carried from the boat is animated. "This pain was more dreadful, ſays Paree, than that which I ſuffered in the boat; one carried me, another ſuſtained the leg, a third held the foot, one carried high, another carried low, one made his ſtep to the right ſide, another to the left, but at laſt they brought me to my bed, and laid me down there to take my breath, and wipe off the ſweat that diſtilled from every pore of my body †." Theſe are the miſeries of being carried in men's arms with

† "Soudain fus porté dans le batteau, pour paſſer de l'autre part, pour me faire penſer: mais le bran-

a broken limb not fixed upon a ſplint. Indeed I need hardly have quoted Paræus to explain what any man of ſenſibility can eaſily imagine.

Perhaps you have at firſt only turned down the ſtocking, or cut the breeches, but the patient being now brought to his own home, you proceed to perform your operations more regularly. You have had your patient conveyed along with all poſſible tenderneſs, but you now proceed to operations which require a degree of harſhneſs, and even of apparent cruelty.

Firſt, You prepare the bed, by lifting the mattreſs and clothes, and in place of the laced canvas bottom, you lay boards acroſs the bed-frame, which makes the bed hard, and keeps it perfectly level and true during the cure. You next, in place of the feather-bed, lay only a mattreſs above the boards; for a feather-bed permitting the patient to ſink down, the body gravitates towards the fractured leg, ſo as often to make the bones overſhoot each other with a dangerous ſhortening of the limb. You next cut another mattreſs into four pieces, and round each piece you ſew a piece of ſheet; theſe are laid over the firſt mattreſs, and ſhifted under the patient from time to time. You then lay a pillow for receiving the limb; and having laid your patient on this bed or couch, you proceed to cut off the breeches, ſtockings, &c.

## OF REDUCING THE PROTRUDED BONE.

The firſt and moſt important point of practice I have to teach you is, how to reduce the bone; and to inſtruct you, I muſt be careful to repreſent the ſeveral poſſible conditions of the parts. Let us firſt ſuppoſe then, that the patient has thrown himſelf from a window on the cry of fire, or let us ſuppoſe that he had a ſimple fracture, had become delirious, had been careleſsly watched, and had riſen from his bed, and ſtalked furiouſly about the room with the fractured bone driven through the fleſh, and ſtumping upon the ground; then the tibia

ſlement d'iceluy me cuida faire mourir, pource que l'extremité des os rompus frayoit contre la chair, et ceux qui me portoient n'y pouvoient donner ordre. Eſtant hors, fus porté en une maiſon du village, avec plus grande douleur qui je n'avois enduré au batteau: car l'un me tenoit le corps, l'autre la jambe, l'autre le pied: et en cheminant l'un hauſſoit à feneſtre, l'autre baiſſoit à dextre. Enfin toutesfois on me poſa ſur un lict pour reprendre un peu mon haleine, où pendant que mon appareil ſe faiſoit, je me fis eſſuyer tout le corps, pource que j'eſtois en ſueur univerſelle: et ſi on m'euſt jetté en l'eau, je n'euſſe eſté plus mouïlle."

protrudes through a very narrow opening, the foot is turned entirely over to one ſide, the bone is as if ſtrangled by the fleſh; it is difficult to extend the limb ſo as to get the bone to go back again through the ſkin, but it is poſſible, and you try it in the following manner: You lay the whole limb quite flat, you make two ſtrong aſſiſtants with both their hands graſp the leg very firmly below the knee, you then graſp the foot firmly over the tarſus and behind the heel with both your hands, and begin to pull gently, ſteadily, and very powerfully, turning the foot a little from ſide to ſide; you alſo twiſt a hand-towel round the ancle, and take the aſſiſtance of it to give you a firmer hold on the foot, and to make you pull more ſteadily and equally. But if the bone will not go back, you muſt give the foot to another ſurgeon or aſſiſtant, and claſp your own hands round the broken part, and with your thumbs, without much reſerve or affectation of delicacy, force in the bone, which, though it needs this force to reduce it, yet lies eaſy when it is reduced.

*N. B.* The ancients not only uſed pulleys and hand-ropes for this purpoſe, which we ſtrictly forbid (we rather dilate the wound), but Hippocrates uſed a wedge, which he introduced betwixt the bones to poiſe them into their places †; and we even find La Motte ‡ uſing the levator of a caſe of trepan inſtruments (I ſuppoſe) for reducing the tibia.

Finding it impoſſible to reduce the bone, on account of the narrowneſs of the wound and its ſwelling and ſtrangulation, you proceed to dilate the wound, you try to puſh in your fore finger or your little finger to conduct the biſtoury, or, if neceſſary, you puſh in the biſtoury, which makes way for itſelf; it is the ſtraight probe-pointed biſtoury you uſe. You have only one danger to avoid, that is, the cutting of the tibial artery, and to avoid that, you keep to the inner ſide of the leg, and oppoſite to the higheſt ridge of the tibia (not to the outſide of the tibia, for the artery lies in the middle betwixt the tibia and fibula); you run your biſtoury forward, and carry it pretty deep, till your finger which follows behind the

† And Fabricius, in the following paragraph, ſeems to approve entirely of the operation of Hippocrates. "Si os retuſum, et præfectum, adhuc difficulter coaptari queat, et metuimus validam extenſionem, in qua propter vulnus multæ fibræ diſtrahuntur, et dolor inſignis excitatur, ut convulſio ſit exſpectanda: tunc Hippocrates reponit fracturam quantum poteſt, et ferramenta quædam (vulgo Scarpelli dicuntur, i. e. Spathulus) altero extremo latiora et tenuiora, inter oſſa fracta imponit, ceu *cuneos quoſdam, et modo vectis inflectit*, ut ſic oſſa magis, quam muſculi extendantur, et reponantur."

‡ Page 293.

biſtoury paſſes in eaſily, and till you feel the ſtricture quite relieved. But if you find the bone ſplintered with points and ſpiculæ, which (if it were reduced) would run into the fleſh, inſtead of reducing the bone in this dangerous condition, you bite off the ſharper points with the cutting forceps of an amputation caſe, and having ſmoothed the bone, you may then, after dilating the wound, reduce it ſafely.

If you find at the ſame time the bone ſtrangled by the narrowneſs of the wound, and pointed at its extremity, ſo that it would be dangerous to return it among the ſoft parts; if you are ſenſible that the bone is broken ſo obliquely, that though reduced, it would not keep its place, but allow the other bone to ſhoot over it, and at the ſame time ſo ſharp pointed that the ſpiculæ would run into the fleſh, you have then to make your election betwixt the two operations of dilating the wound and of cutting the bone; and as you prefer cutting the bone, you proceed not merely to ſmooth it with the cutting forceps of the amputation caſe, but to amputate it in the following manner: Your aſſiſtant takes a flat iron ſpathula to defend the ſoft parts with from the teeth of the ſaw, lays it flat under the bone betwixt it and the fleſh, he holds it ſteady by one or two fingers on each ſide of the bone, and preſſes or draws it up edgeways betwixt the bone and the fleſh, and the ſpathula being thus fixed, you proceed to ſaw the bone as cloſe as poſſible to the wound with the ſmall ſpring-ſaw, commonly put into the amputation caſe for the purpoſe (though never uſed) of ſawing the finger bones.

Thus the bone, being cut into a plain and even ſurface, may be ſafely reduced, and keeps its place well.

Let us next ſuppoſe that the patient has not thrown himſelf from a window, nor fallen from a height, that the bone does not protrude, but that a loaded waggon has paſſed over the limb, and that the bones have been ſo cruſhed, that through one great wound a large piece of the tibia has been ſqueezed out, that the ſeparated piece of the tibia projects, and is eaſily pulled away, that upon introducing the finger through this lacerated wound, you feel the bones all ſhattered, the ſplinters looſe and moveable, the tibia deſtroyed to a great extent of three or four inches, according to the broadneſs of the wheel, and that upon inſinuating your finger, you hardly diſtinguiſh the lacerated fleſh from the bruiſed bone. You perceive that this is a more complicated injury, and will be ſurpriſed that parts thus macerated preſerve their living principle, or ſurvive even a few

days without gangrene; but that the parts which are entirely deſtroyed, that the bones which are ſqueezed through the ſkin, ſhould be regenerated by this maſs of lacerated fleſh and bruiſed bones, is almoſt incredible! it is incredible, by how ſmall a hold of the ſoft parts a piece of bone will ſuſtain itſelf alive, preſerve its circulation, adhere with the ſurrounding parts, and regain its connexion with the unhurt part of the bone! In the moſt alarming circumſtances you never deſpair.

You proceed then to diſengage and pull away any pieces of the bone that are ſqueezed out; you inſinuate your finger into the wound, and hook out any pieces of bone that you encounter with the finger, and which ſeem looſe enough to be hooked away; and uſing the finger as a directory, you venture to introduce upon it the common ſmall dreſſing forceps to lay hold on any looſe point of bone which you cannot compaſs with the finger ſo as to hook it out. This is an operation where good ſenſe and moderation are required; it is not to be learned by experience, for it is an operation which few have an opportunity of repeating often; it will be beſt performed by thoſe who have ſtudied the general principles of the profeſſion, who have been accuſtomed to reaſon and to occupy their minds with the deſign and intention of each operation, rather than with particular methods. In dreſſing a limb thus ſhattered, you take away the pieces which are entirely looſe, becauſe they are plainly deſtroyed, and muſt produce ſuppuration; you are at pains to get away the ſharper ſplinters, though not ſo entirely detached, becauſe they excite ſpaſms by their immediate irritation, and cauſe abſceſs after abſceſs till they are diſcharged; you uſe the finger more than forceps; you would ſpare no preſent pain in order to put the parts in a good condition for lying eaſy, and recovering their healthy ſtate; and although you would take away whatever ſplinters might cauſe abſceſs, you would not work too long with your finger, nor pick with your forceps too curiouſly, leſt you ſhould cauſe more ſuppuration by your own imprudence. But you perceive I might give you a volume of directions, and ſtill be obliged to conclude at laſt, that I muſt leave much to your diſcretion and good ſenſe.

### OF SECURING THE BLEEDING ARTERIES.

Let us next ſuppoſe that the cruſhing of the bones is accompanied with a burſting or laceration of the arteries; the blood always ſtreams from the limb, and cakes about the wound ſoon after; often ſmall arteries bleed ſmartly at firſt, but

ſhrink before you can attend to them, and cloſe entirely by putting a little bit of lint to the wound; but when the tibial artery, as often happens, is wounded, it bleeds ſo as to require attention. Sometimes you have occaſion for the needle, but very rarely, for ſuch is the effect of the laceration, whether by opening the cellular ſubſtance ſo as to receive the extravaſated blood (or in what other way it is immaterial to determine), that even the tibial artery ſtops by merely applying to it a pellet of lint. If the artery continues to bleed, you muſt take a piece of ſponge well dried, apply it as cloſe as poſſible to the mouth of the artery, and make one of your young men hold it down for ſome time with the point of the finger.

But there is another kind of hæmorrhagy ſtill more perplexing: the arteries are ſometimes wounded from within by the ſharp bones, the blood is extravaſated, you open a large ecchymoſis with the lancet, in order to prevent extenſive ſuppuration; the extravaſated blood flows out, the ſkin falls down again, no more blood collects in that place, and you think all is right, and have no apprehenſion of any large artery being wounded, when ſuddenly, and at the diſtance of two or three days, a conſiderable artery begins to bleed from the bottom of the ſac, and after bleeding outwardly, it threatens (when prevented bleeding openly) to inject the whole limb with blood.

Wherever an artery thus threatens to produce ſucceſſive and dangerous extravaſations into the cellular ſubſtance, you muſt cut up the ſkin and muſcles to the place where the bleeding artery is, and although ſometimes you may have occaſion to uſe the needle, generally (even in this kind of hæmorrhagy), you have but to apply a piece of ſponge.

Let us next ſuppoſe, that the fracture is made by a ſhot; that a gardener, for example, has loaded his fowling-piece with ſlugs (for watching his fruit during the night), and having forgotten to draw the ſhot, ſome unwary perſon, perhaps in play, has fired it at another, and ſtanding quite cloſe to him has wounded him in the leg or thigh. There is in this caſe comparatively little bleeding, the hole is round, and admits your finger; ſome of the ſhot has paſſed through, ſome has remained in the leg; the bones are entirely broken, or more properly ſhot away; your finger, eſpecially if there have been a ball in the piece, paſſes through the centre of bone as clear as through the reſt of the wound. In this caſe, the beſt inſtrument for removing the ſplinters of bone, the ſhot, and foreign bodies, is the finger; if you find particular ſplinters of bone, or if you feel ſhot flattened and niched in betwixt the ſplinters of the bone, you work them out with your dreſſ-

ing forceps, or you uſe any ſmall lever to pick them out with; and finally, to clear the wound of any pieces of cloth, &c. which may have been carried in with the ſhot, you may take a ſtrap of fine linen, and with your long iron probe paſs it like a ſeton acroſs the wound, and draw it through, by which you entangle any very looſe ſplinters of bone or piece of cloth.

### OF REDUCING THE PROTRUDED THIGH BONE.

Let us next ſuppoſe, that in place of the leg, the thigh itſelf is fractured, not by a carriage paſſing over it, nor by being caught in the machinery of a mill, nor by the falling in of ſtones in a quarry, but has been fairly broken or ſnapped acroſs by a fall, and driven through the ſkin and fleſh. When the thigh bone protrudes thus, it protrudes forwards, and pierces the thick fleſh of the thigh, making its appearance through the very centre of the Rectus and Crureus muſcles. There is indeed leſs of irregular laceration than when two bones, as the Tibia and Fibula, are broken; there is in general one ſimple wound, and one pointed and projecting bone, but the ſtrangulation round the bone is great, the reduction of it by extending the limb is almoſt impracticable, the finger is not allowed to paſs into the wound, and when, by a little dilatation with the biſtoury, the finger is admitted, the ſurgeon feels ſenſibly ſtrong bridles of the muſcular fleſh, and conſiderable reſiſtance from the tendinous firmneſs of the Faſcia-lata. This is the caſe where (whatever we may determine as to the pinching off of ſplinters, or reducing the bone to a right ſhape) we chooſe to dilate the wound, both becauſe of its natural narrowneſs, and becauſe there would be unqueſtionably great danger of ſtricture were the Faſcia-lata left entire; for when the whole thigh is ſwelled, the tenſion of the faſcia makes that inflammation run into gangrene, which might otherwiſe have paſſed on to an eaſy ſuppuration, or might almoſt have admitted of adheſion.

In the thigh, then, ſo fleſhy and muſcular, and covered with this firm Faſcia, the blunt biſtoury ſhould be carried pretty boldly forwards, and the wound very freely dilated.

### OF THE RECOVERY OF THE PROTRUDED BONE.

But I cannot forſake the ſubject without repreſenting to you once more, not only how eaſily a bone heals, but how difficultly it is deſtroyed; for upon the impreſſion I make upon you in reaſoning concerning this point, will depend much of your

deciſion and good conduct in practice. The natural firmneſs of a bone impreſſes us ſomehow with an apprehenſion that it is not organized like the other parts, nor endowed with the ſame living properties; we can hardly imagine ſo firm a part of the body to be able to renew quickly its connexion with the ſoft parts! yet, in fact, the firmneſs of a bone preſerves its vital ſtructure; you may bruiſe a bone to any degree, but unleſs you cauterize or burn it, you do not deſtroy its vital powers; in ſpite of the moſt extreme injury, it preſerves tenaciouſly its living properties, and is more apt to renew its connexion with the ſoft parts, and to regenerate its loſt ſubſtance, than perhaps any other part of the body; nothing but what deſtroys all its veſſels, or at once deprives them of action, can deſtroy the life of a bone.

When a loaded carriage paſſes over a limb, when it is ſo ſqueezed in the wheels or rollers of machinery that its very marrow is preſſed out, and large pieces of the bone forced through the wound, ſtill the remaining part of the bone, far from being deſtroyed, lives and replaces the loſt piece! When bones are protruded, and ſo preſſed and locked in with one another, that none but the roughest methods can diſentangle them; when it becomes neceſſary to wedge in a lever betwixt them, and poiſe them aſunder, no part of them is deſtroyed, but the ends of a bone thus roughly handled live and unite with each other! When a loaded carriage has paſſed over a limb, recoiled and paſſed over it a ſecond time, and then by the whipping-up of the horſes has paſſed a third time over it; when the limb hangs double like a piece of fleſh; when the bones are ſo cruſhed that the fractured part feels like a pap or maſh, and no bone can be perceived in it, even then the bones, though cruſhed into impalpable pieces, do by no means loſe their vital principle! ſuch a limb ſometimes heals with hardly any exfoliation of bone. When a perſon, perhaps leaping from a height, or running with violence, has broken the leg, he not unfrequently runs headlong two or three paces, the broken tibia (its medullary canal open), ſtriking into the ſoft ground; and often a perſon falling from a tree, or buried with earth by the falling-in of buildings, has had the broken tibia driven deep into the ground, the foot being neceſſarily turned to one ſide, and yet the bone preſerves its life and reunites with the ſoft parts! And what I have next to remark is quite a common accident, that when a compound fracture happens from the falling-in of quarries or coal-mines, the coal ſlack, the lime, the ſoil and gravel are ſo rubbed and mixed into the fleſh and bones, that the bones are abſolutely black, and yet being carefully cleaned, the fleſh and bones perfectly adhere, or with very ſmall ſuppurations.—No one can be ſurpriſed at theſe facts who has ſpeculation enough to obſerve the condi-

tion of a fractured ſcull, where the parietal bone, for example, is fractured, depreſſed, trepanned, and raiſed up again, without its organization or vital principle ſuffering, or its circulation ceaſing for a moment; it immediately reunites with the integuments, and with the adjoining bone, or if left bare of integuments, begins in a few days to granulate of itſelf.

No explanation can be ſuperfluous which ſerves to give you confidence in replacing fractured bones; what I have explained is one of theſe general and important facts concerning the tenacity of life in bones which nothing but much experience could aſſure us of. This confidence the older ſurgeons wanted altogether; they kept bones always naked, they of courſe ſaw them always exfoliate, till this exfoliation came at laſt to be conſidered as a neceſſary and important ſtep in the proceſs of healing; Petit abſolutely wrapped pieces of linen rag round the ends of the protruded bone to aſcertain whether they were or were not alive †, and he continued to dreſs the ends of the bones apart till they exfoliated! but theſe pretences of Petit and other ſurgeons, of dreſſing with balſams, &c. parts which could be ſo very little benefited by any care of theirs, made the practice the more ridiculous. But exfoliation was the doctrine of the day, the older ſurgeons believed that no bone could heal without exfoliating, and that no wound could be cured without ſuppurating; they were at pains to wrap up in rags, to cauterize, to burn a bone, to keep it apart from the fleſh till it exfoliated, for the ſame reaſon that they kept a wound open! for they would permit no wound to adhere, they would have it to ſuppurate, incarne, and cicatrize; that they reckoned the only true canonical cure.

To doubt the life of the bone, and to inſulate it thus, is to kill it; and ſince it was by wrapping up the bone in rags, and keeping it ſeparate from the ſoft parts, that the older ſurgeons forced the ends of the bone to exfoliate, or, in other terms, deſtroyed its vital powers! we may be ſenſible that the beſt means of preſerving the life and circulation of the bone, is by reſtoring, as far as poſſible, the continuity of veſſels. Nothing is more neceſſary towards the healthy action of veſſels than to be oppoſed to other living veſſels: remember this principle in ma-

† "Comme en ce cas il n'eût point été ſûr de laiſſer recouvrir les os, je panſai la playe avec le charpi fec et des lambeaux de linge déchirés, de maniére à tenir les os découverts juſqu'à leur exfoliation." And at the third dreſſing he repeats the ſame proceſs in a different form. "Au troiſiéme panſement, je levai tout, et je replaçai de gros bourdonnets qui faiſoient le même effet autour des os, que les lambeaux de linge."—"*J'obſervai toûjours de bien couvrir et d'envelopper les bouts des os avec des lambeaux de linge* fin, et avec des plumaſſeaux trempés dans de l'eau-devie."

naging protruded or naked bones, whether in wounds, in fractures of the ſcull, or in compound fractures of the limbs; leave in their place all bones that are not abſolutely deſtroyed, as by ſhot; ſeparate none but what come eaſily away; be ſatisfied that where a piece of bone ſticks firm, there will be vaſcularity enough to ſupport it; reduce the protruded bones, and lay the ſoft parts cloſe round them, that, if poſſible, they may adhere.

### OF DRESSING THE WOUND.

This word adheſion leads us naturally into the next ſet of directions which relate to the treatment of the wound, and bandaging of the limb; your aſſiſtants have held the limb ſteady, and ſomewhat extended, and you have picked away the looſe bones, reduced the protruded ends, ſtopped the hæmorrhagy, and cleared the wound of any gravel or ſoil that was forced into it; you now lay the eighteen-tailed bandage on the pillow; you lift the limb gently, and lay it upon the bandage; you and your aſſiſtants draw the limb gently, ſteadily, and with conſiderable force, model it with your hands, and give it a ſeat on its pillow or ſplint, and then proceed to cloſe the wound. I defined a compound fracture to be, that which from the great laceration ſometimes gangrenes, and often ſuppurates; but with care it may frequently be made to adhere. This is always to be your object.

When, after a ſimple fracture, the patient, by falling forwards upon the broken limb, has forced the tibia or thigh bone through the ſkin, the wound is not large, the fleſh is cut, and not much lacerated; it is not only poſſible to make it adhere, but perfectly proper (after reducing the bone), to bring the lips as cloſe as poſſible, and ſtitch them together, as you would do the integuments after the great operations of Hernia or Trepan. When, after a more terrible accident, the limb being torn by machinery, or by carriages paſſing over it, the laceration is great, you may be able, with the help of the needle, to bring two points of the wound together; but the ſides can ſeldom be made to meet fairly, ſtitches are ſeldom uſeful, the ſides of the wound are to be generally ſupported, by laying ſmall and thin pieces of lint on each ſide of the wound; theſe pledgits of lint are ſoon ſoaked with blood, which cakes and adheres to the open part of the wound. By making ſmall rolls and compreſſes of linen and ſoft lint, which you lay upon the edges of the wound (at thoſe particular points where you apprehend a gaping of the lips, or where you apprehend that ſuppuration and cavities will form), you keep the parts very cloſe. You then lay up the tails of the eighteen-tailed band-

age about the limb, and though you cannot uſe a roller (becauſe that would require the lifting of the limb from its pillow at every turn), you give as much firmneſs as poſſible with the eighteen-tailed bandage. The ſteady firmneſs with which you ſupport the parts helps the adheſion, prevents ſuppurations, and hinders an afflux of blood to the limb; over all, you may pour a little of ſome ſpirituous balſam, as the Balſamum Traumaticum.

When the limb is thus dreſſed, the wound which, while the bone protruded, ſeemed ſo very formidable, is very ſmall, the pain is relieved, the very firmneſs of the limb is agreeable to the patient; you then apply the outſide ſplints cloſe to the limb, tie them moderately firm with their ribbands, and having, perhaps, bled your patient, you give him an anodyne and compoſe him to ſleep; it is now that a ſituation which ſeemed very deſperate is changed into a ſtate of hope and expectation †.

J. Bell. 18 Tailed Bandage

† This is the eighteen-tailed bandage, called by the Germans, from its reſemblance to a book, the Book-Band; it is made by ſewing the croſs tails obliquely upon one middle piece of linen, which holds them together, and keeps the ſeveral tails regular.

The navy and army ſurgeon, and eſpecially thoſe who go abroad on active ſervice, ſhould have ſtore of every thing neceſſary for fractured and wounded limbs; of oil-cloth, not to lay the limb upon, but to lay upon the bed under the ſplint at the time of waſhing the limb; ſponges for cleaning the limb with; paſteboard for the ſlighter fractures, as of the fore arm; thin ſhaven wood glued on leather, and then ſplit with a penknife, for the fractures requiring firmer ſupport; numbers of rollers, firm and made of linen, for flannel ones are very filthy by ſoaking up the matter, and very uſeleſs for want of firmneſs. He ſhould have glue, which he will find very uſeful on various occaſions, even of common wounds; he ſhould have ſheet-lead, which being glued upon paſteboard, makes a very firm and perfectly flexible ſplint, which is at the ſame time eaſily cut with ſciſſars or a penknife; he muſt have tin-plate alſo, which being cut with coarſe ſciſſars according to the ſize and form of the fractured limb, can be pinched and turned

OF THE STAGE OF SUPPURATION.

Though you expect to procure adheſion, or at leaſt to make ſome part of the wound adhere, you are often diſappointed; you are ſenſible, from the violence of the fever and the ſwelling of the limb, that miſchief is going on within. The dry ſkin, the parched mouth, the thumping pulſe, the reſtleſſneſs and delirium, continue for ſome days, and there is a blackneſs round the wound threatening gangrene. But this fever by degrees becomes leſs violent, the livor, which proceeded partly from ecchymoſis, partly from the dark colour of the inflammation, gradually changes to green, the great wound begins to ſuppurate and open very wide, the whole limb ſwells to an enormous degree, the ſkin and cellular ſubſtance are ſoft and relaxed, and bear the impreſſion of the finger, the redneſs extends over all the limb, and from the particular hollowneſs and ſoftneſs of certain points, you are ſenſible that great ſuppurations are forming within.

All your prudence, and more eſpecially all your diligence, is required for conducting this ſtage of the diſeaſe. You begin to reflect on the practice you ought to chooſe; you recollect to have ſeen a limb rolled in a maſs of poultice even in the firſt days of the wound, when, by good and careful ſurgery, the parts might have been made to adhere! you remember in every hoſpital to have ſeen limbs lying rotting in this ſame rancid poultice at the very time that they are relaxed and inundated with their own matter! you know that it is contrary to every principle of ſurgery to ſolicit an afflux of blood to a member under ſuch a diſeaſe, or to relax it with poultices, in place of ſupporting the general ſurface with bandage, and the particular hollow parts with compreſſes of lint or ſponge: you know, that to ſay "a compound fracture cannot be properly dreſſed on account of the wound," is but an apology for the moſt ignorant and ſlovenly practice. Thoſe who reſolve to leave a limb thus rotting in its own matter, will, now that our fel-

eaſily with the thumbs, or can be eaſily hammered into a nicer form. In ſimple fracture of the thigh, a tin caſe lined with fuſtian, takes a good hold of the ſurface, and forms the machine of Hildanus; or in compound fracture of the leg or thigh, a tin caſe being faſhioned and bended to the ſhape of the limb, and lined with oil-cloth, makes a ſafe and cleanly caſe, by which the patient can be conveyed ſafely at the time of the accident, and in which the limb may lie eaſy during the cure. The limb being waſhed and cleaned with ſponges, may be padded up again at each dreſſing, by thruſting in little doſſils of tow and ſcraped lint under the hollow parts, to equalize the limb, and raiſe the heel. A man is no more fit to be received into the army or navy, nor indeed to practiſe as the ſurgeon of a village, who is not able to make ſplints for himſelf out of the moſt ordinary materials, than a man is to announce himſelf as a dentiſt who cannot make artificial teeth.

low citizen Dr. Aitken is gone, have, I believe, no better authority than that of Belloſte; but he indeed gives both authority and reaſoning. "It is not at all improbable (ſays Belloſte) that the ſound matter *that comes from wounds may procure their cure.* This will be the more eaſily conceived by thoſe that conſider, that there are ſome learned and ingenious Italians who cure the bloody flux with a ſalt drawn from the excrements of the patient, and thoſe who have the dropſy with a ſalt of the waters drawn from their own belly." We need not reaſon againſt the practice, while others reaſon in this manner for it; ſuffice it to ſay, that by laying a fractured limb in a poultice, reunion is prevented, the texture of the ſkin deſtroyed, abſceſſes created, while the whole limb becomes ſpongy andſ welled.

Suppoſe you are called to recover a limb in this ruined condition, you firſt lay it in a large tin caſe which opens and ſhuts; or upon a large ſplint lined with ſheet-lead. You next waſh the limb with ſoap and water, clean it from its filth, lay pieces of fine ſpongy lint upon the wound and upon the various openings. You then make the whole thoroughly dry, and moiſten the ſurface a little with a ſponge dipped in vinegar and ſpirits. You next apply adheſive plaſters to the ſound parts of the limb, which ſupport it, and defend it from the moiſture. You lay ſmall cuſhions of folded lint to ſupport the hollow parts, and lay ſcraped lint or ſmall ſponges to abſorb the moiſture; and having one or two ſmall paſteboard ſplints covered with leather (or covered rather from day to day with clean linen), you lay them along-ſide of the limb, and by tying two or three ſuch ſplints on each ſide of the limb pretty firm with ſeparate tapes or ribbands (which ſhould lie always under the limb), you give a due ſupport to the hollow and ſuppurating parts, and a comfortable and general ſupport to the whole. The limb lies out meanwhile upon the broad and general ſplint, which being of tin, or lined with ſheet-lead, allows the water with which you occaſionally clean the limb to run off.

You are careful to dreſs the limb every morning, and perhaps to clean it alſo a little in the evening. By regular waſhing and wiping with the moiſt ſponge, you prevent thoſe ſmells which depreſs the patient's ſpirits, and injure his health; and by laying clean lint to the wounds twice a-day, you ſoak up the foul matter; by the occaſional uſe of ſpirituous tinctures, you ſtimulate the ſkin, and keep it in good condition; by waſhing the excoriated parts with ſalt water, you relieve the itching. You examine the hollow and yielding parts of the limb carefully, and after each fit of inflammation, you feel anxiouſly with the point of the finger for

any abſceſs it may have occaſioned. You find new ſuppurations produced, ſometimes by the extravaſations of blood, ſometimes by the pricking of ſplinters, or ſometimes from matter lodging in hollow places; you open ſuch abſceſſes with the point of the lancet, ſoak up the matter with ſcraped lint, and lay ſmall compreſſes upon the hollow places, by which you heal them, and make the internal parts unite.

This is a plan of conduct altogether oppoſite to the filthy oil-cloths, pillows ſoaked with matter, rancid poultices and fomentations, in which you ſo often ſee a limb going to deſtruction. By thus carefully cleaning and dreſſing the ſores, you make ſuch changes, that in the courſe of a few weeks, a limb which had been condemned by a conſultation, is manifeſtly ſaved.

The importance of attending to the general health, and even to the moſt trivial circumſtances connected with the eaſe and comfort of the patient, is very great; you ſhould be careful to have the windows open and the room ventilated, to change the linens, to make your patient waſh his face and hands with cool vinegar and water, and when the matter is very profuſe, to have the room fumigated with vinegar. You give nouriſhing food in ſmall quantities, wine according to the conſtitution and habits of the patient, anodynes according to the degree of pain, fever, or reſtleſſneſs, and laxatives when they are required. You give the Julapium Siſtens and other aſtringents, and anodynes when the diarrhœa is violent; you give ſometimes gentle emetics upon the attack of nauſea and fever; and as for bark, I believe, in place of reminding you to give it when the ſuppuration is great, I muſt rather (ſo common is this preſcription) adviſe you againſt overloading your patient's ſtomach with this heavy drug! three or four drachms of bark is enough to ſicken the appetite of a man in health, much more of a man confined for ſix months to lie on his back.

How much is due to care and cleanlineſs, you may judge from this, that in the caſe of a gentleman who lies in his own houſe, we often venture to ſave a limb, which, had the accident befallen a poor man lying in a crowded hoſpital, muſt have been cut off. In hoſpitals, eſpecially in military hoſpitals, and moſt of all in Hoſpital-ſhips (which the Lords of the Admiralty would do well to burn), the patient ſinks almoſt inevitably under the ſuppuration of a compound fracture.

Often it happens, from the deſtruction of parts, or the unhappy circumſtances of the patient, that all your cares are unavailing! every time you examine the limb, you make diſcoveries of more extenſive deſtruction, you find the whole

limb ſwelling every day more and more, you find the matter running profuſely from the openings, the openings increaſing in number, and the ſuppurations extending from the ham to the heel with intolerable fœtor, the muſcles all undermined, and the bones carious. You find that you are no longer able to ſupport the patient's health, that repeated attacks of diarrhœa and fever have reduced him to extreme weakneſs; and the wan viſage, the pale and flabby fleſh, the hollow eyes and prominent cheek bones, the ſtaring and ſqualid hair, the long bony fingers and crooked nails, the quick, ſhort breathing, and ſmall piping voice, declare the laſt ſtage of hectic and debility! the natural powers are then ſunk ſo low, the appetite for food, and even the deſire of life ſo entirely gone, that we would believe the patient paſt all help, did we not know by experience that it is never almoſt too late to amputate the limb.

Now, it is come to that criſis when our patient muſt die or part with the limb he has ſuffered ſo much to ſave; but he is wearied out with ſuffering, and conſents eaſily to whatever we adviſe; and whatever the difference of opinion on the firſt conſultation, when the limb was firſt laid on its pillow all bleeding and ſhattered, with its bones projecting and its arteries torn, there is none now that it is thus undermined with ſuppurations, with univerſal caries of the bones; the firſt was a ſtate of expectation, the ſecond is a condition where we muſt deſpair. When we are thus ſenſible that further attempts to ſave the limb are incompatible with the life of the patient; when we perceive plainly that the limb thus mangled, ſhortened, and imperfectly cured, would be rather a load to the patient, and a perpetual reproach to the ſurgeon, we perform amputation! there can be no difference of opinion now, becauſe the experiment of trying to ſave the limb has been tried, and has failed.

### OF GUN-SHOT FRACTURE.

Gun-ſhot fracture is the one which, though by far the moſt formidable, appears at firſt the leaſt dangerous; it is a ſmall circular wound which admits the finger, has little ſenſibility, is often bloodleſs, and when the patient is ſtruck, he feels rather ſurpriſe than pain; but when the bones are fractured, the pain is ſometimes very exquiſite, and always the wound degenerates in conſequence of the deſtruction of the bone into a fœtid ſore, with fiſtulas, foul matter, and a diſcharge of carious bones.

When a wounded man is brought to you, you find, perhaps, one ſingle wound

in the thigh, the limb bending, the bone broken, perhaps ſome large branch of the profunda bleeding profuſely, and the man faint and ſick. You immediately lay him in the floor of the cock-pit, or when brought to your tent in the field of action, you lay him upon a bed, or upon the bare ground. You lay a large ſplint (or any coarſe board, any ſpar of wood) under the limb, to prevent it bending and being more injured; if the blood flows profuſely, you thruſt a piece of lint into the wound, and hold it ſteady with your finger; you call your aſſiſtants, and one gives him a cordial, another cuts off the breeches, while you, by preſſing with your finger, prevent loſs of blood. The wound being in the thigh, where ſtrangulation from tenſion of the faſcia is to be feared, you are more willing to dilate the wound; and the bone being ſhattered, and a large artery bleeding (for in a gun-ſhot wound no ſmall artery ever bleeds), makes the dilating of the wound a matter of abſolute neceſſity. Your finger then being ſtill kept ſteady upon the wound, is to conduct your biſtoury; you lift your finger, draw out the bit of lint, paſs your finger into the opening, puſh in your probe-pointed biſtoury upon the finger, and as you open the wound, you puſh your finger deeper until you feel diſtinctly the jet of warm blood; then fixing the point of your finger fairly upon the mouth of the artery, you lay it open, and according to its ſize, either tie it, by making a plonge with the needle ſo as to ſurround it, or ſuppreſs the bleeding, by preſſing a morſel of dry ſponge down upon it.

Your aſſiſtants now extend the limb, and hold it very ſteady; while you puſh your finger deeper into the wound, you hook out the ſplinters of the bone, then you feel a piece of cloth or a button of the breeches, and with the help of a probe, or lever, or dreſſing forceps, you hook it out; you find a piece of the ball and alſo pick it away, but you are ſenſible that the reſt of the ball, or that one of two balls with which your patient was ſhot, lies very deep; you find the wound extending beyond the reach of your finger, you find that it has paſſed almoſt through the thigh, and having reaſon to believe that the ball is near the ſkin on the oppoſite ſide, you make an inciſion there (called a counter-inciſion), and extract the ball, together with whatever ſplinters of bone are driven to that ſide.

The ſhot having paſſed through the thigh bone, you get out the ball, pieces of bones, cloth, buttons, keys, ſword, belt, and other foreign bodies in this way with the finger; when the ſhot has paſſed through the fore arm, or tibia and fibula, or through a group of bones, as the carpus or tarſus, it is ſometimes uſeful to draw a ſlip of dry linen through the wound with your long iron probe.

The wound being thus cleared, you proceed to dreſs it, not with any expectation of procuring adheſion, that in gun-ſhot wounds is impoſſible! you never pretend to ſtitch a gun-ſhot wound, though I have actually ſeen this abſurdity committed. You put adheſive plaſters round the limb, becauſe you know that it muſt lie long ſoaking in ſuppuration; you bring the wound cloſe together with compreſſes upon the ſides of it, a piece of fine lint over the mouth of the wound, and you bind it with a ſtrip of fine linen. You lay the member on a firm ſplint or caſe of tin, to prevent any bending of it, and you dreſs it always perfectly dry; you pour ſometimes a little ſpirits upon it, uſing no poultice nor any thing but compreſſes of dry lint, padded ſplints, and circulars of ribband to tie them with and to ſupport the limb. You ſhould never forget this circumſtance, that the rangers in the woods, who never are within a houſe, who are continually expoſed to freſh air, in conſtant motion, and living from neceſſity on a ſpare diet of the coarſeſt kind, who merely bind up their wounds with a piece of lint and a ſlip of linen, heal to a miracle! while thoſe who are nearer what is called help, who are thrown into a foul hoſpital, and who, if they are able to walk, loiter about in idleneſs and naſtineſs, or who, if wounded in their lower extremities, lie with oils, poultices, and rancid ointments applied to their limbs! infallibly ſicken and die.

In the progreſs of ſuch a wound, the ſloughs will come away ſpontaneouſly, the ſuppuration need be encouraged in no other way than by ſupporting the general health, the carious bones will uſually be diſcharged of their own accord, perpetual care is required in keeping the wound clean, cloſe, and dry. The way of curing the fiſtulous ſores that remain after gun-ſhot wounds, has been already explained †.

† As an admirable example of diligent practice, I think it right to give the ſtudent an opportunity of reading the following moſt inſtructive caſe from Wiſeman, and which, from his dramatic manner of repreſenting it, is not leſs intereſting than inſtructive.

" In heat of fight at ſea, among the many wounded men that were put down into the hold to me, one of them had his right arm extremely ſhattered about two fingers breadth, on the outſide above the elbow, by a great ſplinter. I ought to have cut off this man's arm preſently; but a ſudden cry that our ſhip was on fire put me in ſuch diſorder, that I rather thought of ſaving myſelf than dreſſing my patients. I haſtily clapped a dreſſing upon the wound and rolled it up, leaving his arm in his other hand to ſupport it, and endeavoured to get up out of the hold as others did, verily believing I ſhould never dreſs him nor any of them more; but our men bravely quitted themſelves of the fire-ſhip, by cutting the ſpritſail tackle off with their ſhort hatchets (which they wore during fight, ſticking in their ſaſhes); ſo we were freed of the fire, and by our hoiſting up the topſails, got clear of our enemy, and I returned to my work; but I was at a

OF COMPOUND FRACTURE AND LUXATION,

WHEN THE JOINT IS DISTORTED, THE BONES FRACTURED, AND THE INTEGUMENTS LACERATED.

It is in the lower extremity only, which bears the whole weight of the body, that we are to look for ſuch complication of injury as is deſcribed in theſe words; and however a compound fracture of the arm or fore arm may deſtroy the part itſelf, life is actually in danger only in great fractures of the lower extremity, which forms ſo great a proportion of the whole body. The ancle joint is never diſlocated unleſs when the Fibula gives way; it is never entirely diſtorted, and the foot turned tranſverſe, without both bones, both Tibia and Fibula being broken; and when it is entirely diſlocated, the integuments are torn at the inner or outer ancle, and often the tibia or the aſtragalus are forced through the wound, and the head of the bone on which the body reſts quite expoſed. If

loſs what to do with this man, who lay not far off complaining of his arm; I would have cut it off inſtantly with a razor (for the bone being ſhattered, there needed no ſaw), but the man would not ſuffer me to meddle with his arm, he crying, it was already dreſſed.

The fight being over, and we got into the next port, I cauſed this mariner's bed to be ſet up (which was four pieces of wood nailed together and corded, and a bear's ſkin laid upon it, and faſtened between two guns to the carriages); upon this I ſaw him placed; and having ordered his arm to be laid ſo that I might the better come to dreſs it, I ſent for dreſſings, and laid them orderly upon a ſmall pillow well ſtuffed and quilted in the middle. Upon this pillow I firſt laid a ſoft double linen cloth, next to that three ligatures, then a paſteboard wet in vinegar, to make it more ſoft and pliant; upon that I laid a double cloth, of ſuch length and breadth as might ſerve to encompaſs the fractured member, which I cut from each end to the middle into three binders. Over the middle of this I placed a ſplenium of cloth four double, four fingers in breadth, and of ſuch a length as to give ſtrength to the fracture. Over this lay my defenſative ſpread upon a thick cloth, of ſuch a breadth and length as to take in the whole arm. Dreſſings thus laid upon the pillow, I cut off the other from his fractured arm, and placed the pillow with theſe dreſſings cloſe by his ſide, ſo that I ſaw his arm laid as I deſigned upon my reſtrictive, and his hand upon his breaſt; then putting my fingers into his wound, I pulled out firſt a piece of a ſplinter an inch thick or thereabouts, more or leſs, then rags and bones, great and ſmall; I left not the leaſt ſhiver. When I had ſo cleared the wound of all the extraneous bodies and looſe bones, I was amazed to feel what a void ſpace there was between the ends of the bones; but I proceeded, and cut off the lacerated lips, which were of no uſe, and dreſſed up the ends of the bones with a couple of doſſils dipped in ſpir. vini and mel. roſ. warm. The reſt of the wound I dreſſed as warm with axung. porcin. and merc. præcipat. with ſome little ol. terebinth. ſpread upon doſſils, which I placed lightly within the wound, and upon pledgits without, with an empl. diachalcit. malaxed with ol. myrtill. over all the wound; then I embrocated the fractured arm cum ol. myrt. et olivar. immatur. and a little acetum, bringing my reſtrictive emplaſter, which lay under the arm, over the whole arm, from the arm-pit to the elbow, and cloſe round about, only leaving a ſpace to dreſs the wound.

a man falls from a height, and lights with one foot on a round ſtone, the foot is turned to one ſide, the integuments are burſt, the inner ancle or proceſs of the Tibia protrudes, and the Fibula is broken, ſo that the foot is turned entirely to one ſide. If, again, a horſe rears and falls above its rider, if a man's foot is caught in the machinery of a mill, if a man falls from the back of a carriage and his leg is entangled betwixt the ſpokes of the wheel, the foot is turned round, the integuments burſt, the Tibia and Fibula are more or leſs expoſed, and the aſtragalus or bone on which the leg is ſupported, is either broken or turned entirely out from its ſocket, diſengaged from the Tibia, and almoſt ſeparated from its connexions with the other bones of the foot. Whether the Tibia only is protruded, or the aſtragalus diſplaced, or both, you perform the ſame operations; and whatever may be the deciſion of a conſultation afterwards, your duty is immediately to replace the foot and cloſe the wound. Always, you proceed in the firſt inſtance as if you had no doubt of ſaving the limb.

This gave a ſtrength to the weak member, and was deſigned to prevent the influx from above. Juſt under this emplaſter there lay a ſplenium. To anſwer that, I applied three more, one on each ſide, and another above; which four were of ſuch a ſize, that they lying a little off from one another, encompaſſed the arm. They were ſpread lightly with a little cerote made of axungia, and wax to make them adhere where I placed them.

Then I brought the bandage which lay under the ſplenium, with three heads at each end. The lowermoſt of theſe took in the lower part of the arm from the elbow upward, with part of the fracture, and was faſtened on the exterior part of the arm. This preſſed the ſanies from the nether part of the arm to the wound, and hindered the lapſe of matter that way. The middlemoſt was made to preſs the matter out of the wound, and keep the lips down; the uppermoſt ſerved to reſtrain the influx, as I ſaid, and preſſed that matter out which was already in the part. This bandage was made with great moderation, and ſo faſtened, that it might be looſened without trouble to the patient. Then I brought the wet paſteboard cloſe to the ſides, and cut another piece to anſwer it, which I wetted in aceto, and by the three ligatures under made them faſt, but without diſturbance to the patient. If it could not have been ſo put on, I ſhould have foreborn the uſe of them, the cure of theſe wounds conſiſting in the eaſy dreſſing and quiet poſition, without which you will not cure one of them. The paſteboard, as it dried, ſtiffened, and retained its ſhape, preſerving the fracture in the poſition I left it, and that with a very ſlack bandage. Thus I finiſhed the firſt dreſſing, leaving my patient in much eaſe. He ſlept pretty well that night, and was the next day as well as I could expect. He was let blood the ſecond day, and kept to a ſpare diet; but we allowed wine as a cordial to all our patients.

The third day I dreſſed him again, took off the upper paſteboard, and looſened the heads of the main bandage; alſo I took off that ſplenium which was over the wound, and raiſing up the emplaſter from the wound, took out many doſſils, found it warm and well diſpoſed, and dreſſed it up quick with my ſuppuratives hot, and an emplaſter as before. I ſtirred not the reſtrictive, but made now a compreſs more par-

In general it happens, that the Aſtragalus or Tibia having burſt through the integuments, the bones are ſo ſtrangled in a ſmall ſlit or opening, that no degree of force will reduce them; you do not, in this caſe, cut off a bone ſo neceſſary to the joint as the inner proceſs of the tibia! you never, unleſs it be already entirely ſeparated, cut away the aſtragalus; you firſt extend the foot very powerfully, and preſs in the aſtragalus, and try to reduce the bones; but failing in this, you make a free inciſion, extend the foot, replace the aſtragalus betwixt the proceſſes of the Tibia and Fibula, and having cloſed the wound, you lay a piece of lint upon the lips of the laceration. You then place the limb on a large and ſtiff ſplint, in a manner which ſurely I need not explain, and with ſuch pillows, compreſſes, and bandages as you find neceſſary for keeping the foot in its right poſition with regard to the leg. All this is not eaſily performed, ſometimes bone-ſetters have two or three of them attempted for ſeveral hours to reduce a luxated ancle, but in

ticularly for the wound, purpoſing not to remove the two outermoſt heads of the main bandage, unleſs it were ſometimes to give a little breathing to the member; but the middle I opened as often as I thought fit, to dreſs the wound. The other two had ſhort ſplenia to make the bandage equal. But I was not then ſatisfied how the ſpace between the fractured ends of the main bone could be ſupplied with callus. My patient was eaſier than any of my other with fractured wounds. When it came to my turn to be viſited by my brother chirurgeons of our ſquadron, they did not diſlike the wound, nor my way of dreſſing (for we being uſed to ſee one another's patients, had all much one way of dreſſing), but they laughed at the excuſe I made for not cutting off his arm, and doubted I ſhould be yet forced to do it. But I kept my patient flat on his back, and that after a while was his greateſt pain; for the wound digeſted, and the tumor was not then conſiderable. After the wound was well digeſted, and the bruiſed fleſh ſeparated, I renewed the dreſſings, taking all the old ones off, and fomented the member with warm water, to give a breathing to it; then applied a catagmatic emplaſter, dreſſed the wound with mundific. Paracelſ. or ſuch like, and bound up the member as at firſt, and ſo continued my way of dreſſing as I ſaw cauſe, putting into the wound only a doſſil or tent made upon a ſkewer, ſoft and hollow, to give way to the wound to incarne; I ſcarce uſing any injection, but by gentle compreſſion aſſiſting Nature, who ſeldom faileth in ſupplying the loſt ſubſtance in wounds, if we diſturb her not by improper applications. The next taking off and renewing theſe dreſſings of this fractured member was occaſioned ſome ſixteen or ſeventeen days after, by a troubleſome itching of the part, which was occaſioned, I ſuppoſe, partly from his liberty in diet, partly by the heat of the weather, and want of tranſpiration. Upon this account I took off the dreſſings, bathed the member with ſea-water, and dreſſed him up with emplaſt. de lithargyro. The wound was about this time well incarned within, and the lips beginning to cicatrize from their edges; I dreſſed them with epulotics, as unguent. tutiæ, &c. All this while I kept my patient upon his back, and renewed not the whole dreſſing until I was again neceſſitated. One day coming from the ſhore (where our wounded men had liberty to lodge, if they deſired it, and were dreſſed up by us there), I found this patient with a heat all over his body like an eryſipelas, at which he was much affrighted. He had, it ſeems, drank wine too liberally with his mates (as they would moſt of them do, if they were any thing well), unleſs it rather proceeded from a

vain, from not daring to make the neceſſary inciſion: Sometimes alſo the beſt and moſt ingenious ſurgeons have endeavoured in vain to keep the foot right, which, although bandaged to a firm ſplint, or lodged in a ſquare box, and bent into the beſt poſition with compreſſes and wedges, has been found diſtorted from time to time. This difficulty I have often experienced, and yet muſt leave you to your own ingenuity, for you have time to contrive means of reſtraining this tendency of the foot to turn aſide, and the contrivances are of the moſt obvious kind.

The limb being thus laid, you are not to promiſe yourſelf abſolute ſucceſs, but the ſurgeons whom you have ſent for being arrived, you conſult together upon the probable event of the caſe; and ſo very favourable is the aſpect that matters aſſume after thoſe operations have been nicely performed, that the conſultation will very rarely order the limb to be cut off; they ſoon leave you to your own prudence, and adviſe in general terms that every thing ſhould be done to preſerve the limb. You are now afloat and muſt abide the chance of time and circumſtances, for after a day's delay the limb is inflamed, and you never call a ſecond conſultation; it is too late (whatever changes come upon the limb) to perform amputation with ſucceſs; nor, indeed, muſt you be alarmed at the appearance of gangrene, even in this caſe, where gangrene is ſo often the cauſe of death, for the force with which the parts are twiſted, or the bones driven through the ſkin, occaſions an extenſive ecchymoſis, which reaches along the leg and up

generation of callus, in which caſe it uſually happens. I let him blood, and dreſſing him as in an eryſipelas, finding his arm pretty ſtrong, and his wound healed within, and in a fair way of cicatrizing, I raiſed him up, after he had lain about eight weeks; all which while, I believe, he never ſtirred his arm from the time I firſt placed it, but only while I renewed the dreſſings, he being the moſt patient man in that reſpect I ever attended; and in truth, without that ſubmiſſion, he could ſcarce have been cured.

There was in this patient a ſtrong callus filling up the void place of the loſt bone at leaſt two inches, with little or no ſhortening of the arm; but the joint of the elbow was ſo ſtiff from the poſition it lay ſo long in, that he could not ſtretch that joint whilſt I knew him, which was until that ſhip was caſt away.

My memory will be much cried up for remembering ſo many particulars in a patient ſo many years ſince cured by me; but if you conſider how remarkable a caſe it was, and in my trade, there will be leſs wondering at the poſſibility of it. You may inquire what was done by me in the cure of Captain Reade, where the loſs of his jaw was ſupplied by a ſtrong callus, and that cheek made uniform with the other. It will be long remembered by the then ſtanders-by, though not of our profeſſion. In our ſea-fights, oftentimes a buttock, the brawn of the thigh, the calf of the leg, are torn off by chain-ſhot and ſplinters. All theſe are contuſed wounds, and look black, and do too often deceive the unexperienced chirurgeon, he taking them by their aſpect to be gangrened, and by dreſſing them as mortifications with Ægyptiac. and ſpir. vini, doth certainly ſphacelate them, and thoſe perſons die miſerably afflicted."

the thigh itſelf, ſo that the whole limb is almoſt black. Nay, you muſt not be alarmed even though this blackneſs turn into a true gangrene, though veſicles riſe, the part loſe all feeling, and the patient lie in a degree of ſtupor; for ſuch gangrene is often but ſuperficial, it is confined to the ſkin, it is limited even to a ſmall portion of the ſkin, and in eight or ten days ſmall ſloughs are thrown off, the ſuppuration is eſtabliſhed, and the patient revives. Such laceration ſeldom or never adheres immediately, yet is often cured by ſuppuration; and ſometimes when pieces of the tibia and fibula have been ſeparated and thrown off, when the aſtragalus has been fractured, and one half of it cut out by the ſurgeon, the joint has healed; nay, it has even happened that the aſtragalus has been ſo entirely twiſted out of its place, that it has mortified and been removed by the ſurgeon, and yet the gangrene has ceaſed, the ſuppuration has been eſtabliſhed, granulations have filled up the great hollow, the outward wound has cloſed, and (though it is difficult to believe ſo ſurpriſing a fact), the bone has been ſo far regenerated, that the patient has walked firmly on that foot, and with a free motion of the ancle, a new joint having been formed. Yet you ſhould be aware, that ſuch cures are never perfect; after even the leaſt of thoſe accidents the joint continues long weakly, always rheumatic, apt to ſwell with the ſlighteſt fatigue, and requires to be firmly ſupported by a well padded buſkin laced firmly round the joint; I have ſeen ſome patients, indeed, who did not abſolutely need this, but few who did not acknowledge the comfort, ſecurity, and ſtrength it gave them.

## OF THE QUESTION OF AMPUTATION.

I have, in the courſe of thoſe practical rules, ſtudied to impreſs you with confidence in the powers of nature, and have laid before you all thoſe conſiderations which may encourage you to preſerve the limb, even when apparently deſtroyed. I have explained, that though the bone be protruded three or four inches, the foot not only turned to one ſide, but puſhed upwards along the bones of the leg, and much of the projecting bone cut off, the limb may ſtill be ſaved. That when, in the tranſports of delirium or mania, the patient ſtarts from his bed, and dances and runs upon the protruded tibia; when loaded waggons or machinery have ſo cruſhed a limb, that ſeveral inches of the bone are ſqueezed out, ſtill the limb may be ſaved. I have repreſented to you how a man ſhot through the arm, neglected from the confuſion of a battle, laid afterwards upon a bear's ſkin, ex-

tended betwixt two carriage-guns, and with ſome inches of the ſhoulder bone ſhot away, may be ſaved †. I have explained to you, that the injury ſeems dreadful and irrecoverable in the firſt moment after the accident, whereas, after the firſt operations of ſmoothing and reducing the bone, every thing aſſumes a moſt favourable and flattering appearance; and I have hinted, that a conſultation of ſurgeons might condemn a limb in the firſt moment (while lying in a ſhattered and diſordered ſtate), who, upon ſeeing it reduced and dreſſed, would find reaſon for hope, and would be not unwilling to truſt to time and good conduct. And finally, I have taught you not to be raſh in ſacrificing a limb, not to be abſolute and deciſive in any caſe, that only excepted where the experiment of trying to ſave the limb has been tried and has failed! where the patient is dying from profuſe ſuppurations, but ſo ſlowly as to give time for both ſurgeon and friends to be convinced that the amputation is a matter of neceſſity and not of choice.

I have juſt mentioned, that in luxation of the ancle joint, even the Aſtragalus, the great bone of the joint (a bone not inferior in ſize to the head of the thigh bone), may be diſplaced, ſeparated, and cut entirely away, and yet the limb be ſaved; yet this, Gentlemen, is the caſe in which, according to my experience, gangrene is ſo apt, or rather ſo ſure to happen, that thoſe who have been ſaved after ſuch an accident, have been ſaved by chance, while hundreds have died of the gangrene which uſually enſues: A ſucceſsful caſe now and then in a medical journal obtrudes itſelf upon your notice, but it is one caſe picked out of ten thouſand. When you are called to a caſe of this kind, you take immediate meaſures for reſtoring the parts to their natural ſituation, and putting the patient in a ſtate of eaſe and comparative ſafety; but your chief duty is that of calling together a conſultation of ſurgeons, to decide whether or not you ſhould attempt to ſave the limb. The mention of this queſtion never returns without producing ſerious impreſſions on my mind, and I believe I cannot cloſe theſe Diſcourſes more uſefully or reſpectfully, than by ſaying a few words on the ſubject.

I am ſorry to obſerve this the moſt important queſtion perhaps in ſurgery, treated as if it were no queſtion, but rather a rule of practice, which might be eſtabliſhed on the moſt abſolute grounds! When a ſurgeon condemns a limb, he does not ſay, that if amputation be not inſtantly performed the patient will die, nor is he diſappointed if the limb be ſaved; he thinks both more ſenſibly and more humanely. He knows that there is great danger of loſing the patient's life

† *Vide* foot note, page 660.

in attempting to ſave his limb, and reckons it his appointed duty to adviſe amputation; but he is ſtill ſenſible that the limb may poſſibly be ſaved, and often, after his honeſt opinion is rejected, contributes, by his attention and kindneſs, to that moſt deſirable object. Sometimes he feels it to be his duty to adviſe amputation, and to repreſent very ſtrongly the manifold dangers of attempting to ſave the limb, while yet he rejoices to find his patient willing to hazard all thoſe dangers, in favour of an object which it muſt be the chief honour of the ſurgeon to accompliſh.

But there is yet another thing to be regarded, as well as the great object of ſaving the patient's life, for there never is an unqualified and perfect ſucceſs. The patient feels nothing but the deſire to ſave himſelf from the deformity and lameneſs which amputation cauſes, little thinking how deformed and lame the limb may prove after he has paſſed through every kind of danger and ſuffering to ſave it. But we have much more to reflect upon, and much broader grounds for reaſoning. Let us but conſider, if (in a caſe of very dangerous fracture) the man die, how great the loſs, the diſappointment, and the regret of friends; even if he live, how great his own ſufferings, and how imperfect his cure! A man, for example, in the middle age of life, has his limb cruſhed, ſo that conſultations are convened on the queſtion, and it is thought juſt poſſible that it may be ſaved; he is laid in bed, and the neceſſary operations of dilating the wound and reducing the bones are performed; abſceſs, caries, hectic, and every kind of diſtreſs enſue; for two years he lingers in his houſe, and then is carried to a ſucceſſion of watering places in hopes of recovering his health. He is lame and walks on a ſtilt, and his natural conſtitution has received an irreparable ſhock; he falls in the courſe of thoſe two years of diſtreſs, from the condition of a young and healthy man, to the ſtate of a valetudinarian, diſpirited and dejected, travelling now the downhill way of life; he has loſt his health and ſaved a limb, which he drags after him with labour and pain.

Now this is much to be regarded, for often the limb is ſo ruined, that no ſurgeon could wiſh it ſaved. The ſurgeon in condemning a limb, regards its mangled condition, and can hardly be ſo imprudent as condemn that limb which is ſo little diſordered, that it may not only be ſaved, but may become ſhapely, ſtrong, and uſeful. The preſent dangers of the patient, the danger of loſing his conſtitution and health, and the mangled and hopeleſs form in which the limb lies before the ſurgeon, all bear upon his mind, when he declares with

reluctance that it ſhould be cut off. When the caſe ſeems thus hopeleſs to the ſurgeon, the complication of chances is very intricate! The patient may die of the immediate injury and gangrene; or he may ſurvive, while the limb, already ſeized with gangrene, may be deſtroyed, ſeparating naturally, or with a little help from the ſurgeon. The limb alſo may be ſaved, as well as the life; it may eſcape the gangrene, but the degree of injury which threatens gangrene uſually leaves a limb ſo deformed and ſhortened, that it proves a mere load and encumbrance to the patient, and hardly an honour to his ſurgeon. Laſtly, The limb may, notwithſtanding this dreadful and complicated injury, turn out a clean, ſhapely, and uſeful limb; but how ſmall the chance of this perfect recovery, after the limb has been condemned by a judicious and humane man, who underſtands his profeſſion, and has added experience to knowledge?

But let us not argue this as an abſtract queſtion, but come to ſome ſenſible and viſible proofs. Firſt, I ſuſpect, and indeed I dare affirm, that often the ſurgeon repents of the limb he has ſaved at the riſk of the patient's life. La Motte having ſaved the life of a young man who had his arm and leg both cruelly fractured, by his horſe falling with him upon ice, acknowledges that paralyſis of the wounded ſide came on a few days after the accident, and that he was ſo imperfectly cured that he dragged the limb after him entirely lame; he then aſks the queſtion himſelf, "May it not be doubted, whether we ſhould not in ſuch a caſe have judged more wiſely in amputating the limb †?" But other authors as ingenuous, as worthy of credit, leave no ſuch doubts, do not apologize like La Motte, by ſaying that the boy, even in this condition, preferred his own mangled limb to a wooden one, but declare to us plainly, that their patients, though old and of a humble ſtation, could not endure their ſituation. "Eſther Parſons (ſays Mr. Lucas) was admitted into our infirmary with a compound fracture; one of her legs was taken off above the knee; from the other leg, four inches of the tibia were removed, and due pains taken to make the woman as comfortable as her deplorable ſituation would allow."—"After a confinement in bed for upwards of *ten months*, various attempts were made to ſupport her on crutches; but after trying this for a few weeks, ſhe endured ſo much pain, that ſhe begged to have the remaining limb amputated, for it was to a degree burdenſome to her, without a proſpect of any amendment ‡." This patient now was a woman, with all the fears and delicacies

† "Doutant ſi dans le commencement nous n'aurions pas mieux fait d'en venir a l'amputation," &c.

‡ Page 234.

of a woman; was advanced in years, and reduced by ſuffering of every kind; her employments ſedentary, and her ſex not requiring any active way of life; ſhe had felt the pains of amputation and the loſs of a limb; ſhe could compare her future ſituation with her preſent miſery, and yet ſuch was her ſenſe of the diſtreſs of carrying ſo unwieldy a limb, that though juſt returned as it were from the dead, ſhe was ready once more to ſubmit to a terrible and dangerous operation. I myſelf have ſeen a patient require the amputation of ſuch a limb, and have ſeen it performed, it was crooked in behind the ſound one, and was a ſerious occaſion of diſtreſs and trouble.

Secondly, I ſuſpect, and can alſo venture to maintain, that ſurgeons often give a favourable report of limbs too miſerably ſhattered to be ſoundly healed, only becauſe they have had the good fortune to preſerve them. But had it ſo chanced, that the ſurgeon had condemned theſe ſame limbs, and the patient refuſing the ſurgeon's advice, had perſiſted in preſerving them, we ſhould have had them deſcribed in very different terms. One of the oldeſt of the modern ſurgeons, in a fit of peeviſhneſs, has let off a deſcription of this kind, which has amuſed me. "A young lady," ſays Saviard, "Mademoiſelle Duclos, on the 8th of November 1694, was buried, along with numbers of others, under a pile of wood; twenty were killed, but this lady eſcaped with a dreadful fracture of the leg, in which the aſtragalus was luxated, and indeed quite turned round, while many ſplinters of bone protruded through the ſkin. The limb was in a condition which, according to all rules of good ſurgery, required amputation; but Meſſrs. Beſſiere, Gigot, and myſelf, though we delivered one unanimous opinion, could not perſuade her to ſubmit to amputation, all our arguments, prayers, and entreaties were in vain. After many months of ſuffering, and various ſuppurations, ſhe was at laſt cured, with the loſs of the lower head of the tibia, eſpecially that portion which articulates with the aſtragalus and forms the inner ancle."

"This lady remains (ſays Mr. Saviard) in the very condition that Mr. Beſſiere and myſelf predicted, walking on ſtilts, dragging after her an unwieldy and ſhapeleſs limb, diſtreſſed with frequent pains, while, by ſubmitting to the operations we propoſed, ſhe might have eſcaped indeſcribable diſtreſs during this very tedious cure; ſhe might, indeed, have been very ſoon cured, and ſoon able to walk with pleaſure †." It is, no doubt, an unhappy ſight for a patient to look to his wooden

† "Elle eſt reſtée depuis dans l'état que nous luy avions prédit Monſieur Beſſiere et moy; c'eſt à dire, avec une groſſe jambe incapable de mouvement, ſouffrant de temps en temps des douleurs conſiderables,

leg, and reflect that it is poſſible his limb might have been ſaved to him; but let him compare his condition with that of a perſon dragging after him ſuch a maſs of macerated fleſh and crooked bones.

I believe I ſhall give the cleareſt view of this ſubject, by telling you that I do not regard the moſt perfect ſucceſs as a proof of judicious practice. I will even venture to deſcribe one of the moſt unprecedented examples of ſucceſs in the cure of a bad compound fracture, as an inſtance of that very ſituation in which the limb ought, by all the rules of ſurgery, of prudence, and of common ſenſe, to have been cut off.

It is a caſe related by the celebrated Verduc, nearly in the following terms: A man about ſeventy years of age, was thrown down by a waggon, in a ſtreet where the declivity was very ſteep; he fell flat upon his face, the wheel went over his leg and fractured it very cruelly. The driver, confounded at what had happened, allowed his waggon to recoil, and the wheels running backwards on this ſteep declivity, paſſed over the old man's limb a ſecond time, then the villain ſeeing what deſtruction he had made, and expecting to make his eſcape, whipped up his horſes and drove his waggon a third time over this ſhattered limb. When the wounded man was brought to me (ſays Verduc), I ſaw a great wound in the lower part of the leg, with a prodigious hæmorrhagy, and then taking the leg in my two hands, and bending to the inſide and outſide, I perceived that it bowed on all ſides, and had no other ſtay but the fleſh; and to make this accident as formidable as in nature it could be, the old man had an ulcer with caries of the bones, at the very part of the ancle where the wheel had paſſed and repaſſed, which carious ulcer he had ſuffered during forty years.

Verduc ſtopped the bleeding with lint and compreſſes, and aſtringent powders. He put two ſplints as props under the fractured part of the limb, laid his patient on a ladder with quilts under him, and had him carried home; in carrying him up ſtairs, the limb, in ſpite of every precaution, ſuffered a good deal. After laying him in bed, the limb was again dreſſed more regularly and carefully; the hæmorrhagy was ſuppreſſed, yet it returned again, ſo that at midnight all the dreſſings needed to be renewed. Next day another ſurgeon was joined with Verduc

contrainte de ſe ſervir de bequilles, pour ſe tranſporter d'un lieu à un autre: au lieu que par l'amputation *que nous luy avions propoſée*, elle ſe ſeroit épargnée les douleurs incroyables qu'elle ſouffrit pendant ce long traitement; elle auroit été bien plûtôt guerie; et elle ſe ſeroit trouvée bien-tôt aprés ſa gueriſon, en état de marcher avec plus de facilité."

in conſultation, they found half the leg, and all the upper part of the foot gangrenous, amputation was propoſed, but Verduc by his particular care ſtopped the gangrene and ſaved the limb.

Let us next obſerve, according to the regular courſe of the narrative, what this old man ſuffered, and how he was cured. The ſloughing of this ſuperficial gangrene of courſe carried away the ſkin; the muſcles which bend the foot lay expoſed and quite putrid, ſo that the ſurgeons needed to make deep inciſions into them; and by the tenth or twelfth day, the tibia (long carious and now deſtroyed by the fracture), lay bare to the extent of two or three inches, and was as black as ink; the Tendo-Achillis was alſo expoſed. This was the firſt diſorder produced by the gangrene, and you may judge of the ſtate of the limb, after the exfoliation of the tibia, by this, that the want of the tibia ſo enlarged the hole into which Verduc was accuſtomed to throw his cleanſing injections, that you could ſee through and through the leg! while the ſhattered fibula on the other ſide produced (by its points ſticking in the fleſh) a ſucceſſion of ſuppurations and ulcers.

After ſix months the condition of the limb was little improved, the fibula was ſtill exfoliating, the abſceſſes were renewed from time to time, the fibula was bare and carious, and Verduc was buſied applying actual cauteries to the bone at each dreſſing; there was formed alſo a gangrenous ulcer of the heel, which required the limb to be lifted and dreſſed daily for two months. Nor is it to be forgotten as a real picture both of the ſufferings of the patient, and of the diligence required on the part of the ſurgeon, that through all the ſix months during which the corruption and putrefaction, and various grievous diſorders laſted, Mr. Verduc employed every day five or ſix hours (including morning and evening dreſſings) in preparing the apparatus and cleanſing and dreſſing the ſores.

"I reckon (ſays Mr. Verduc), that this complicated fracture may ſerve as a model and general rule for all that I can ſay upon this head; but what was the happieſt circumſtance of all, the patient recovered perfectly in the ſpace of eighteen months; ſix months after he walked, at the age of ſeventy-two years, without a cane, and he lived nine or ten years after."

So happy a circumſtance was this recovery, that I think it almoſt a miracle; ſo great was the merit of Verduc in preſerving this limb, that he was, in my opinion, much to blame in making the attempt. Such pains as he took were very commendable, but then "all his ſervice in every point twice done, and then done double," was but a poor recompence for the raſh attempt he had entered upon.

The man ſurvived, and Verduc had a proud tale to tell; but had he died! what could Verduc have ſaid in vindication of himſelf, hazarding in this manner the life of ſo old and diſeaſed a creature? Were this very caſe ſubmitted to my judgment, ſhould an accident in all reſpects parallel happen again, I would reflect on the caſe of this man only as a mere exception, as an example of what a man will come through who has a powerful, unſubduable conſtitution; I would take this very caſe as a warning, rather than an example, and give an opinion directly oppoſite to that of Verduc. Were a man of ſeventy years of age, his leg ulcerated to the bone for forty years, to have his leg not only fractured, but miſerably cruſhed by a loaded carriage paſſing three times over it; and were there, in addition to the fracture of bones already carious, a violent hæmorrhagy! I would ſay, "It is not impoſſible this man may ſurvive! We are met here in conſultation, whether we ſhall or ſhall not amputate his limb, which implies that we know it to be poſſible that he may ſurvive! we read in Verduc of ſuch a caſe, in which the man lived; but his eſcape is reckoned by all judicious ſurgeons to be a miracle; and the more it is a miracle, the leſs is it an example. In that very caſe, the hæmorrhagies, the gangrenes, the ſloughings, and the exfoliations, were ſuch as put the man's life in daily jeopardy; and of the ten years he had to live, he lingered out two, in the filth and miſery of a ſick-bed. Therefore, notwithſtanding this caſe, recorded by one of our moſt reſpected authors, I adviſe for this old man as I would judge in the caſe of my own parent, that the limb be cut off without delay."

Pott himſelf eſcaped with life after one of the worſt compound fractures; yet Pott approves of amputation, and diſapproves of Belguer's opinions, of his books, his practice, his tranſlators, and abettors in this country. The moſt ingenious men differ on this important point; and there is a reaſon for that variety of opinions with which in your future ſtudies you may be perplexed. One ſurgeon adviſes amputation, and gives alarming repreſentations of the dangers attending a compound fracture; to him it appears, that the attempt to ſave a lacerated limb is almoſt certain death: But he is one who has practiſed in the hoſpital, or in the unhealthy ſuburbs of ſome great city, where the lower ranks of people ſwarm in filth and wretchedneſs, where in all ſeaſons fevers and infection prevail. Another declares loudly againſt this deſtruction of limbs, declaims about the powers of nature and the conſtitution: But we find that he has practiſed among hale country men, labourers, workmen, and villagers, whoſe robuſt conſtitutions withſtand every ſhock,

and who recover after being buried in quarries or the ruins of buildings, though dragged out but half alive. Another, who has practiſed in ſome great mercantile town, preſents you with inſtances of the moſt extraordinary cruſhing, diſtortion, and mangling of the joints and bones; relates caſes where men little leſs mangled than if they had been broken on the wheel recover perfectly: But are we not to conclude, that ſuch extraordinary caſes are merely the exceptions to the general rule? Thoſe are the wonderful caſes which obtrude upon our notice in every medical collection, yet they are rare and ſolitary inſtances of ſucceſs, while the number of thoſe who die is unknown; their numbers, if fairly reckoned, would conſtitute the general rule; but who has an intereſt in collecting examples of gangrene and ſudden death?

The army ſurgeons of different countries, and even of the ſame country, hold opinions directly oppoſite to each other. In one ſeaſon or country, in one hoſpital, or after one particular battle, the men are healthy, the wounds heal as by miracle, and few amputations are required; but in another battle, in unhealthy camps, in ſickly ſeaſons, in places where the men are expoſed to cold, moiſture, infection and want, all thoſe whoſe limbs the ſurgeon attempts to ſave, periſh.

You muſt be perſuaded then, that in reſpect of this great and intereſting point of practice, there can be no abſolute rule in nature; nor is it poſſible that any ſingle man ſhould be qualified, by practiſing in various climates, ſeaſons and ſituations, by feeling in his very perſon all thoſe influences, to lay down any abſolute rule. No man of good ſenſe will venture even to imagine himſelf capable of aſcertaining this queſtion, and the perſon the moſt inclined to eſtabliſh abſolute aphoriſms on this difficult point, would be leaſt of all entitled to the public confidence. Time, place and circumſtance, always modify the queſtion, and give a peculiar and individual character to each particular accident. Thoſe who in their writings maintain the moſt oppoſite opinions, would not, I believe, debate one moment, if brought to the bedſide of a patient to conſult about a particular caſe.

It is with the hopes of awakening your attention to a great and important queſtion that I have touched on it in this place, and it is to furniſh you with matter for reflection that I have been at pains, through all this tedious volume, to lay before you, in a minute, particular, and ſomewhat of a dramatic form, the moſt ordinary accidents of practice. When ſuch difficulties come upon you, read, reflect, retire within yourſelves! and may you, as you advance in years, have the

comfort of believing that you have, on every trying occaſion, conducted yourſelves with honour, integrity, and prudence: It is a happineſs which, in our uncertain profeſſion, no human wiſdom nor diligence can abſolutely enſure.

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